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THE PRIVATE PHYSICIAN'S OPPORTUNITY IN INDUSTRIAL MEDICINE*

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IN general, when one speaks of a private physician one means a physician who is primarily concerned with the protection of the health of individuals rather than of social groups. He is the physician who, in the course of his practice, is concerned with treating the physical ills, great or small, of patients who come to his office or whom he sees in the home, the clinic or the hospital. To offer his patients the benefits of the most up-to-date and the best medical knowledge, he wages a constant struggle to keep informed of the latest developments in medicine, a science that becomes more and more highly technical and specialized.

Because of the pressure of his practice and because he must keep abreast of technical advances, the private physician may lose sight of the fact that medicine has social and economic aspects; he may forget that the social causes of illness are just as important as the physical ones, and that he lives and works in relation to a given economic and social system. He may be so absorbed in his work with individual patients that he fails to discern a larger problem — the opportunity and responsibility to serve society.

Yet, if the private physician is to act consciously and intelligently, he must have some knowledge of social and public-health problems outside the immediate sphere of his routine practice — problems that he may consider, at first glance, to be completely unrelated to his work. One of these problems is that of industrial health.

All physicians are aware that the United States today is engaged in a program for the defense of its national interests. Furthermore, they know that the core of the defense program is industrial production — the speed with which adequate quantities of vital defense materials can be supplied. How many physicians, however, are aware of the relation of a high level of industrial health to the attainment of a high level of industrial production? How many realize the nature and extent of the problem of industrial health, and the effect of industrial disability on production? How many recognize that they have an opportunity to help solve these problems and thereby not only to aid in the success of the national defense program, but also to make a contribution of great and lasting social value to the welfare of the Nation?

I shall briefly discuss the problems of industrial hygiene with which the private physician should be familiar, and the efforts that he can make toward their solution.

Nature and Extent of the Problem

According to the latest census, the total labor force in the United States today is approximately 52,000,000 — this gives some indication of the magnitude of the problem in terms of numbers alone. So far as the health status of this large group of workers is concerned, despite years of continued improvement in industrial hygiene, industrial accidents in the United States still take an annual toll of 18,000 lives and cause 90,000 permanent and 1,782,000 temporary disabilities. Many problems still arise from diseases peculiar to certain occupations, such as silicosis, lead poisoning and the dermatoses, most of which are preventable.

It is also well known that industrial workers have higher rates of physical defects than nonindustrial workers, and that excessive mortality is especially notable in unskilled workers, among whom the death rate from all causes is 100 per cent or more in excess of the death rate among agricultural workers. Of greatest significance, however, is the enormous waste of life and efficiency resulting from nonindustrial illness among workers. As a matter of fact, the amount of

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time lost from work because of ordinary illness is fifteen times as great as the total time lost owing to accidents and occupational diseases combined.

Effect of Industrial Disability on Production

The conditions cited as the cause of disability in industry account for an enormous loss in time — nearly 400,000,000 days a year. The monetary cost of this lost time runs into billions of dollars. In terms of defense materials, this lost time may be interpreted as the number of days it takes to build approximately 50 dreadnoughts of the *North Carolina* class, 165,000 combat tanks or 90,000 bombers. It is true that we know how to control the majority of industrial-health hazards, but it is also true that there is a lag in the application of that knowledge, just as there is a lag between knowledge and its application in other fields. If even a 10 per cent reduction in these time losses could be achieved, it is evident that much would have been done toward removing a serious obstacle to the success of the defense program and toward furthering the health of the Nation.

Needless to say, all these problems in industrial hygiene have become magnified with the present expansion of industrial activities. Preliminary data already indicate a marked rise in the incidence of accidents and occupational diseases among workers. Those who are concerned with maintaining the worker on the job at a high level of health and efficiency have a real responsibility. By creating safe and healthful working conditions *now*, the prospect of being faced in the future with thousands of men and women whose health has been irreparably damaged because of exposure to harmful conditions in industry will be minimized. This, to my mind, is the least we can contribute to the national defense effort.

I cannot presume to discuss mental hygiene, nutrition, the home environment of the worker, housing, and wages and hours, all of which are important aspects that should certainly be included in any serious discussion of the broader perspectives of industrial health.

Method of Attack

Basically, the problems to be attacked can be divided into two types: those concerned with the hygiene of the individual, and those dealing with the environment in which the individual works. The first function comes within the scope of the medical sciences, and the second deals with engineering practices.

So far as the working environment is concerned, it is within the province of the medical profession to determine the existence of such diseases as may be due to the working environment, whereas on the basis of the physician's findings, the engineer is in a position to learn what unhealthful conditions should be investigated and where control measures need to be initiated. It is essential therefore that the various professions clearly understand the functions of each and approach the solution of the industrial-hygiene problem as co-workers in a joint effort, co-operating with each other to the fullest extent.

Because nonindustrial diseases among industrial workers are just as common as and more serious economically than those among the general population, industrial hygiene has rightfully been considered a function of the general field of public health. It is for this reason that the medical profession plays such an important role, since it is one of the chief concerns of that profession to assist in the promotion of better health in the community.

Present Practices in Industrial Hygiene

Industrial organizations are becoming more and more aware of their responsibilities concerning the protection and improvement of the health of employees. This is especially true of the large plant, which is in a better economic position to deal with this problem than the small plant, which finds it very expensive to provide more than a limited industrial-health service to its workers. Present-day trends indicate that industrial-hygiene services furnished by industry are on the increase and of late have been extended to include not only the prompt treatment of injuries and diseases arising from occupational exposures, but also other services, such as dental, ocular, x-ray and educational programs for health promotion. Many plants have also included programs for systematic study of the working environment in an attempt to control deleterious exposures, and others have established programs designed to diminish the time lost from general illness.

Many nonofficial agencies have of late become deeply interested in the problem of employee health. Some of these agencies, such as the Industrial Hygiene Foundation, are primarily supported by industry itself.

The federal government, of course, has been active in this field for many years. The division of industrial hygiene has been a part of the United States Public Health Service since 1914. Its functions include the co-ordination of all industrial-hygiene activities, both at federal and state levels, the promotion of industrial-hygiene service in state and local health departments, and investigations of a laboratory and field nature. These activities are conducted co-operatively with state

agencies, industry, labor, the medical profession and other professions and organizations.

The growth in the number of state health departments providing services in industrial hygiene has been almost phenomenal during the last five years, under the stimulation of funds provided by the Social Security Act. Today, there are thirty-four states with industrial-hygiene services, employing nearly two hundred and fifty professionally trained persons and spending approximately one million dollars for this activity.

In spite of all this progress, however, actually only a beginning has been made in providing adequate programs for the maintenance of employee health. The United States Public Health Service recently published the results of an analysis of a survey made in approximately 17,000 establishments employing 1,500,000 workers in fifteen representative states.[1] This analysis showed that only 15 per cent of the employees were provided with the services of full-time physicians, and that approximately 22 per cent were furnished the services of part-time physicians or physicians on call. These data are sufficiently representative to show that approximately two thirds of the workers in the United States are without any medical services at the plant proper.

Furthermore, the results of a recent study by the National Industrial Conference Board[2] indicated that in one third of the plants surveyed no efforts were made to supervise nonoccupational disabilities to assure the worker of medical attention. This study also showed that in only slightly more than half the plants was an effort made to promote employee health through educational means, and that only casual supervision was practiced over working conditions.

It may be assumed, therefore, that most industrial workers, when in need of medical services, receive them from the private practitioner — on a part-time basis at the plant, from physicians on call or from the family physician. It is a well-established fact, however, that the physician who spends but one or two hours a day in a plant, as well as the one who merely goes to the plant when called, has not the time to devote to a program of disease prevention.

This state of affairs, therefore, calls for serious consideration on the part of the medical profession regarding its responsibility in the vital field of industrial hygiene.

Possible Contributions of the Physician

It has been stated by authorities in industrial hygiene that the major needs are medical and surgical care to effect prompt restoration of health and earning capacity following disability, the prevention of disability in industry by the proper control of the working environment and, finally, the promotion of health among workers. For those physicians holding positions in industry, and especially those completely responsible for furnishing programs of industrial-health maintenance, the Council on Industrial Health of the American Medical Association has suggested a definite procedure.[3]

This program consists in such functions as periodic inspection and appraisal of plant sanitation and occupational exposures, followed by the adoption and maintenance of adequate control measures. The provision of first-aid and emergency services and the prompt and early treatment of all illnesses resulting from occupational exposure are very significant functions of the medical department. Impartial health appraisals of all workers and provision of rehabilitation services for the correction of defects are additional functions of a medical department. And, finally, by means of recording and reducing absence due to all types of disability, it should be possible to make real progress in reducing lost time among workers, thereby not only benefiting the worker's physical well-being but also yielding tangible monetary advantages to both employer and employee.

The Council on Industrial Health of the American Medical Association has been very active in stimulating physicians, individually and through medical organizations, to contribute to the health of industrial workers. The council has also suggested the formation of committees on industrial hygiene in state and county medical organizations, and has clearly outlined a program that could be adopted by the state and local societies. The program of activities formulated for these committees comprises the following objectives: to train physicians to recognize and report occupational disease; to train industry and labor to the value of industrial health conservation; to elevate medical relations and standards under workmen's compensation; to scrutinize all social legislation affecting industrial health; to clarify relations between industrial and private practitioners; to improve relations between physicians and insurance companies; and to establish working relations with all state agencies interested in industrial health. I shall elaborate several of these objectives.

It is highly essential that physicians inform themselves further concerning occupational diseases, so that they may recognize such diseases more readily in the course of their practice. It would be advantageous for a private practitioner to make this effort, since he may be called on to

diagnose and treat such ailments in the course of his everyday practice.

It is pertinent to stress one other important item, namely, the necessity for obtaining an accurate and detailed occupational history. It is well known to what great lengths physicians go to obtain an accurate and detailed personal and past medical history of a patient, and yet they often neglect to obtain information concerning the patient's exposure to toxic materials in industry. Because a man's occupation may have a real bearing on his health, it is imperative that a history of his occupation be obtained in detail and interpreted properly. Such an inquiry may often necessitate investigating the patient's working environment or at least obtaining information on this point from the proper plant officials as well as from the patient himself. As an example of the advantage of the occupational history, a recent investigation by the United States Public Health Service indicates that manganese poisoning may often be mistaken for multiple sclerosis or Parkinson's disease.

With further reference to the subject of occupational diseases, it is obvious that unless the physician, whether he is in industry or in private practice, promptly reports to the proper authorities the occurrence of occupational diseases among workers, it will be next to impossible for the official agency responsible for the control of such diseases to carry out its functions. Physicians should adopt the same attitude toward the reporting of occupational diseases that now exists in the reporting of communicable diseases. The recurrence of such diseases may be prevented by a prompt investigation by a state industrial-hygiene service of the conditions in the plant that may include the causative agents. Once these have been established, prompt measures may be taken for the control of the environmental conditions responsible for the diseases.

In addition to these responsibilities, still another obligation should be given consideration. This deals with advising the individual patient regarding his health. The physician is the only one to offer such advice, and it is likely that he will have more success in doing so than anyone else. The patient's co-operation should be enlisted not only in the prevention and control of diseases arising out of the occupation, but also in the promotion of general health and mental well-being.

The physician can make still another important contribution to industrial medicine by stimulating pre-employment and periodic physical examinations of workers in industry, and by calling attention to the necessity for correcting the physical defects revealed by health examinations.

I have repeatedly stressed the need for co-operating with the local health agencies, which are responsible for protecting the health of workers. The private practitioner, either as an individual or through his state or local medical organization, should utilize to the fullest extent the services that may be rendered by the official industrial-hygiene unit, and through it the facilities available in the entire health department. With the exception of Maine, all the New England States today have industrial-hygiene services. Services that may be rendered by the official agencies include: consultation with plant management regarding needed corrections of environmental conditions; advice to the management and medical supervisor concerning the relative toxicity of materials or processes, as well as that of new materials prior to their introduction into the industry; assistance in developing, maintaining and analyzing absentee records; consultant service to medical supervisors, private physicians, compensation authorities and other state agencies regarding illnesses affecting workers; provision of necessary laboratory service; and integration with other public-health bureaus in their programs for workers — for example, the control of cancer, syphilis and tuberculosis.

* * *

I have attempted to define some of the problems of industrial hygiene, the methods employed in their solution and the opportunities that the physician has to make a real contribution toward the maintenance of employee health. I should like to commend to you the thought, expressed by Dr. C. D. Selby,[4] that every physician in industry should consider himself a health officer of that industry. As a matter of fact, I should like to go a bit farther and recommend this point of view not only to the industrial practitioner, but also to the private practitioner in his contact with the industrial patient. It is only by such an approach that progress will be made in efforts to conserve the health and efficiency of millions of workers.

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CLINICAL CLASSIFICATION AND DIAGNOSIS OF HEMORRHAGIC DIATHESES*

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THE abnormal tendency to bleed has been a medical enigma for centuries, and only within the last few years has some semblance of order emerged from this hitherto chaotic field. Immediate and widespread practical application has followed recent advances in knowledge of the hemorrhagic diatheses, and although, as Nygaard[1] has pointed out, no accurate etiologic classification is at present available, from a clinical point of view it is essential to group these conditions into certain logical categories. In a series of 124 cases of various hemorrhagic disorders, an attempt is made to employ a classification that relates as closely as possible the etiologic and pathogenic factors to the clinical aspects of the disease. Moreover, on this basis, the diagnostic value of certain clinical and laboratory procedures is outlined.

CLASSIFICATION OF HEMORRHAGIC DISORDERS

Hemorrhage may be considered to occur for only two fundamental reasons — either because of failure of the vascular integrity or because of a defective blood coagulating mechanism[2]; of course, the two conditions may coexist.

Defective Vascular Integrity

It is customary to divide vascular disorders into nonthrombocytopenic and thrombocytopenic purpuras (Table 1). Unfortunately, owing to inadequate methods of clinical investigation, comparatively little is known about capillary bleeding.[3, 4] It is well established, however, that unrelated to platelet deficiency the anatomic and functional integrity of the vascular endothelium can be adversely affected by a variety of agents, such as trauma, lack of vitamins C and P, and various toxic, allergic and metabolic processes. These so-called "capillary purpuras" form the largest group of hemorrhagic disorders, and Quick[4] and, more recently, Haden and Schneider[5] have pointed out that disorders of this type are more significant than coagulation defects from a practical standpoint. Little comment concerning this group is necessary. Subclinical scurvy is commoner than realized; toxic purpuras are of frequent occurrence, and if all cases with slight hemorrhagic tendencies were included, the group would be considerably larger. The diagnosis of these nonthrombocytopenic purpuras rests mainly on the history and the fact that clinical laboratory procedures are negative, with the exception of a positive capillary fragility test in certain cases.

Of much more serious implication are conditions in which capillary disturbance is associated with a decreased number of platelets. These may be subdivided into secondary and idiopathic thrombocytopenic purpuras. In the secondary type, the platelet reduction is due to depression or destruction of the marrow by toxic, allergic, chemical or physical agents. Severe purpuric manifestations are frequently encountered in leukemia and aplastic anemia. In this study of 41 cases of leukemia, hemorrhagic lesions developed in 16. Purpura of this type also occurs (but less frequently) in neoplastic metastasis to the bone marrow and in pernicious anemia.

TABLE 1. *Hemorrhagic Disorders Characterized by Defective Vascular Integrity.*

ETIOLOGY	CLINICAL EVIDENCE	No. OF CASES
Nonthrombocytopenic purpura		
Vitamin C (and P) deficiency	Scurvy	14
Chemical, bacterial or unknown toxin	Purpuras accompanying various intoxications	26
Allergy	Henoch's purpura and those of other types	2
Physical and metabolic defects	Purpura, following heat, cold, trauma, asphyxia and sclerosis	6
Congenital defects	Hereditary capillary telangiectasis	1
Thrombocytopenic purpura		
Secondary to toxic, allergic, chemical or physical agents depressing or invading the marrow	Purpuras accompanying leukemia, pernicious anemia, metastatic bone-marrow lesions, aplastic anemia and benzol, x-ray and arsphenamine poisoning	25
Idiopathic (splenic or megakaryocytic)	Essential purpura	5
	Total	79

The pathogenesis of idiopathic thrombocytopenic purpura remains obscure, owing to the lack of knowledge concerning the role of the platelets and the physiology of the capillaries. Wiseman, Doan and Wilson[6] state that the lack of platelets is the most significant and universal finding in this disorder. The cause of the thrombocytopenia has not been definitely established, but the likeliest

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theories are either that the spleen exerts an abnormal thrombocytolytic activity or that in some manner as yet unknown the spleen inhibits the production of platelets by the bone marrow. However, other investigators, especially Elliott,[7] emphasize the role of the capillary disturbance. Until further information is obtained concerning the relation of the platelets to the release of thromboplastin, to clot retraction and to capillary permeability, the problems involved in the etiology of essential purpura will remain unsolved.

Regardless of theoretical considerations, the differentiation of idiopathic and secondary thrombocytopenic purpura is an extremely vital matter. On the one hand, an ill-advised splenectomy will result in disaster, whereas in the properly selected case a dramatically successful cure will often be accomplished. Special emphasis should be placed on a careful history and physical examination, with particular attention directed toward uncovering possible etiologic factors, such as drug intoxication, allergy, infections and lesions involving the bone marrow. In both types of thrombocytopenic purpura, the bleeding time is usually prolonged, capillary resistance and platelets are markedly decreased, and clot retraction is poor or absent. The clotting time is usually normal but in severe thrombocytopenia may be prolonged, and Nygaard[8] points out that the plasma is usually hypocoagulable. Wiseman et al.,[6] in their excellent article, stress the facts that the spleen, liver and lymph nodes are not enlarged in idiopathic thrombocytopenic purpura, and that except for the diminished platelets, unless severe blood loss has occurred, the blood and bone marrow studies are not abnormal. Limarzi and Schleicher[9] strongly advocate bone-marrow studies, and most investigators agree that this procedure is essential before splenectomy.

Defective Blood Coagulation

In considering the coagulation aspects of hemorrhagic disorders, Quick[4] points out that as a result of the researches of a number of workers a satisfactory hypothesis of the mechanism of blood coagulation is now available. Briefly stated, it is postulated that the plasma contains a protein substance of unknown composition called prothrombin, which is elaborated in the liver through the agency of vitamin K. When blood is shed, this inert substance is converted to thrombin by thromboplastin in the presence of ionized calcium. Thromboplastin is said to be a cephalin-protein complex normally found in the tissues and platelets. Recent work[10] indicates that a substance similar to tissue thromboplastin also exists in the plasma. As a second phase, thrombin activates soluble fibrinogen to insoluble fibrin. Fibrin acquires the characteristics of adhesiveness, contractility and elasticity, forming the blood clot.[11] On the other hand, it is recognized that certain anticoagulants exist, and although the role of heparin is a matter of debate, it apparently activates the

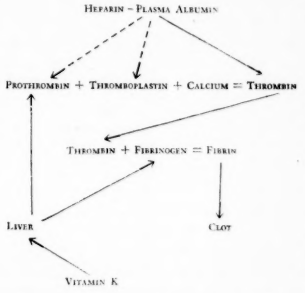

Figure 1. *Theory of Blood Coagulation.*

serum albumin to an antithrombic or antiprothrombic capacity.[12] Modified after Quick[4] and Eagle,[13] this theory is diagrammatically expressed in Figure 1.

It may be assumed that any anomaly of the clotting mechanism could result in a corresponding hemorrhagic disorder. Nevertheless, from a clinical standpoint, deficiencies of calcium are unknown, and acquired or congenital fibrinogenopenias are extremely rare.

Of great physiologic and clinical interest is the deficiency of thromboplastin. It is now fairly well established, in large measure owing to the work of Patek, Stetson, Taylor, Pohle and Lozner,[14–16] that hemophilia is caused by a lack of thromboplastin. It is still a controversial point whether this deficiency is caused by an intrinsic lack of a plasma thromboplastin or whether the lack of thromboplastin is due to the slow release from platelets that are abnormally resistant to disintegration. Hemophilia is infrequently encountered in practice, but the characteristic occurrence in the male, in addition to the usual hereditary features and the history of bleeding episodes, makes the diagnosis relatively obvious. Furthermore, the greatly prolonged clotting time associated with normal bleeding time, normal platelet count and clot retraction, prothrombin level and capillary resistance usually confirms the clinical diagnosis. Quick[17] recently pointed out that, in doubtful cases, study of the clotting time of recalcified plasma may yield valuable information.

Hypoprothrombinemia has assumed an increasingly significant clinical role since the advent of vitamin K and the simple laboratory tests for prothrombin. Such conditions are encountered with relative frequency, are usually easy to recognize, and for the most part are amenable to specific therapy. The lack of prothrombin is commonly associated with liver disorders, and it should be emphasized that vitamin K frequently has little effect on raising the prothrombin levels in the presence of continued liver damage. Twelve cases of hepatitis and cirrhosis in this series had intractable bleeding, uncontrolled by vitamin K. From the practical standpoint, the most serious and most commonly encountered hypoprothrombinemias are those due to deficiency of vitamin K either because of lack of absorption from the gastrointestinal tract, as in obstructive jaundice, bile fistula and bowel lesions, or from the dietary lack of vitamin K, especially in hypoprothrombinemia of the newborn.

In differentiating hemorrhagic disorders due to defective coagulation, it is essential, first of all, to suspect a real or potential lack of one of the constituents necessary for coagulation and, secondly, to investigate the degree and nature of the deficiency by proper laboratory methods (Table 2).

TABLE 2. *Hemorrhagic Disorders Due to Defective Coagulation.*[4]

ETIOLOGY	CLINICAL EVIDENCE	NO. OF CASES
Calcium deficiency	None known	0
Fibrinogen deficiency	Fibrinopenia	
Congenital	Congenital fibrinogenopenia	0
Acquired	Severe liver damage and nutritional and bone-marrow disturbances	0
Thromboplastin deficiency	Thromboplastinopenia	
Lack of plasma (thromboplastin or faulty release of platelets thromboplastin	Hemophilia vera (2) and sporadic hemophilia (1)	3
Prothrombin deficiency	Hypothrombinemia	
Liver damage	Hepatitis and cirrhosis	12
Deficiency of vitamin K	Deficiency of vitamin K	
Lack of absorption	Obstructive jaundice, bile fistula and bowel disturbances	8
Dietary deficiency	Hypoprothrombinemia of newborn	19
	Total	42

Miscellaneous Disorders

Less well defined are a miscellaneous group of hemorrhagic states (Table 3) occupying a midzone between the capillary and clotting disorders, about which there is inadequate knowledge. These cases often have hereditary or familial characteristics, and various terms have been employed in designating these disorders, such as hereditary hemorrhagic diathesis, pseudohemophilia and thrombasthenia. In this series, 3 cases were placed in this category. Usually, the clotting time, platelets and prothrombin levels are normal, but there may be prolonged bleeding time, poor clot retraction and decreased capillary resistance. Circulating anticoagulants, including the transitory phenomena of peptone and anaphylactic shock, have been reported but are very rare. In this regard, the report of Lozner, Jolliffe and Taylor[18] on a case of a patient with a circulating unidentified anticoagulant is of considerable interest. Another somewhat neglected phase of the clotting mechanism that may markedly influence the occurrence of abnormal bleeding is that of syneresis or clot retraction.[19] Proper retraction, adhesiveness and elasticity are necessary for normal clot formation, and in addition to the physical role of the intact platelets in the clot structure, further study may indicate that the disintegrated platelet or other substances modify the intrinsic retractile properties of fibrin. A recent report by Rabinowitz[20] on the effect of methionine on clot retraction should arouse renewed interest in this aspect of the problem.

TABLE 3. *Miscellaneous Hemorrhagic Disorders.*

ETIOLOGY	CLINICAL EVIDENCE	NO. OF CASES
Unclassified	Thrombasthenia	2
	Pseudohemophilia	1
Intrinsic fibrin defects	Lack of retraction, adhesion and elasticity	0
Presence of anticoagulants	Peptone and anaphylactic shock; unclassified types.	0
	Total	3

LABORATORY PROCEDURES

In part, the confusion and obscurity attending the diagnosis of bleeding disorders has been due to the lack of application of uniform and relatively simple laboratory tests. Table 4 lists the nature and outcome of such procedures in the major hemorrhagic disorders.

In addition, complete blood studies, the Hinton test and urinalysis should be carried out routinely, as well as special determinations for vitamin C, calcium and fibrinogen when indicated. When performed accurately and subject to proper interpretation and when correlated to the clinical findings, these procedures, which are economically and technically available to practically everyone, should result in a correct diagnosis in all but a few of the most obscure hemorrhagic disorders.

Summary and Conclusions

The various hemorrhagic disorders in the light of recent advances may be grouped into certain logical categories.

In establishing a diagnosis of abnormal bleeding, the value of a careful history and physical examination related to certain laboratory procedures is stressed.

In this manner, in a series of 124 cases of various hemorrhagic disorders, satisfactory diagnoses were established and the proper treatments instituted in all but a few cases.

39 Bay State Road

Table 4. *Laboratory Procedures to Be Used in the Diagnosis of the Major Hemorrhagic Diseases.*

Test	Idiopathic Thrombocytopenic Purpura	Capillary Purpura	Hemophilia	Severe Hypothrombinemia
Bleeding time, Duke[21] (normal, 2–4 min.)	Prolonged	Normal	Normal	Prolonged
Clotting time, Lee and White[22] (normal, 5–10 min.)	Normal	Normal	Prolonged	Prolonged
Clot retraction (normal, complete in 1½ hr.)	Poor	Normal	Normal	Poor
Platelet count (normal, 350,000)	Decreased	Normal	Normal	Normal
Capillary resistance	Poor	Normal or poor	Normal	Normal
Prothrombin clotting time, Quick[22]	Normal	Normal	Normal	Prolonged

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UNDULANT FEVER IN MASSACHUSETTS

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UNDULANT fever was recognized as a clinical entity by Marston[1] in 1861, and the etiologic agent was first observed by Bruce[2] in 1887. In 1897, the name "undulant fever" was given to the disease by Hughes[3], and in 1905 the goat was found to be the reservoir by Zammit,[4] of the British Commission working in Malta. In the same year, Craig[5] reported the first authentic case of brucellosis in the United States, but the first intimation that the disease was endemic in this country came with the work of Ferenbaugh[6] in Texas in 1911. Some years elapsed before cases were recognized with regularity in New England, but since 1928 the Massachusetts Department of Public Health has been keeping individual epidemiologic records of the disease. Although it was not made reportable until 1930, an occasional case history was obtained in years previous to that time, 14 such case histories being on file.

Since the disease was made reportable, 331 cases have been recorded through 1940. Until 1934, no more than 15 cases were recorded in a single year, but after that time more than 40 cases were reported in most years: 1935, 42 cases; 1936, 55; 1937, 43; 1938, 37; 1939, 40; and 1940, 52. No doubt, the principal reason why the number of cases has become higher is that physicians have become more alert in suspecting the disease. This is evidenced by the increase in the number of specimens sent to the State Laboratory for undulant-fever agglutination tests. From 1929 through 1940, the numbers of specimens examined in successive years were 167, 280, 401, 339, 374, 457, 742, 1105, 1393, 1871, 1933 and 1996. It must be realized that these figures include a large number of duplicate specimens on the same persons, because in some cases the diagnosis was partly dependent on an increasing titer of agglutination.

It was believed that a summary of the information contained in the epidemiologic records accumulated by the department would be of interest to physicians of the State. In all, 337 histories have been obtained from the 345 cases that have come to our attention since 1927.

It should be pointed out that the information is not at all comparable with that which would be available from hospital records, since in many cases details are somewhat sketchy, partly because the histories were frequently obtained as soon as the disease was suspected and before all the characteristic symptoms had occurred, and partly because the patients had been seen by several physicians, no one of whom had all the details of the illness. It should also be borne in mind that the primary purpose of the records was to aid in deciding whether the case was really undulant fever, and when it appeared that the diagnosis was justified no further details seemed to be needed.

The inadequacy of the information in these epidemiologic records is indicated by the fact that, after the information available regarding the symptoms, the course of the disease and the laboratory work had been considered, in only 160 cases (48 per cent) was the diagnosis unequivocally justified. On 104 cases (31 per cent), information was less adequate, but it appeared that the disease was probably undulant fever. In 47 cases (14 per cent), from the details available, there seemed to be a possibility that the disease was undulant fever, whereas in 26 cases (8 per cent) information was so inadequate that no opinion was ventured.

Seasonal Prevalence

The Mediterranean type of undulant fever in Malta is usually most prevalent in the summer. In Massachusetts, where the disease is largely due to *Brucella abortus* instead of *Br. melitensis*, there is very little tendency toward predominance in any season, the cases being fairly evenly distributed throughout the twelve months — January, 29 cases; February, 17; March, 25; April, 24; May, 30; June, 28; July, 27; August, 28; September, 23; October, 36; November, 32; and December, 32.

Age and Sex Distribution

On the Island of Malta, the sexes are apparently about equally involved by undulant fever, but in this country there has always been a predominance of males. In our cases, there were 199 cases among males and 85 among females. The comparative rarity of reported cases in the young is likewise borne out by our figures, only 6 per cent of the cases occurring under ten years of age and less than 11 per cent of the total cases between ten and nineteen, whereas each decade thereafter shows approximately double that percentage.

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Occupation

In contrast to the observations of Hardy et al.,[7] who found that packing-house employees and workers on farms in Iowa were more frequently attacked, in Massachusetts only 4 of the 270 patients whose occupations were specified were meat handlers; 19 were engaged in farming, and 14 in dairying. The groups most frequently attacked comprise perhaps the largest portion of the population in the State, such as persons engaged in housework, mechanical workers, students, factory workers and clerical workers. This indicates that the method of transmission in Massachusetts may be materially different from that in Iowa. The distribution is one that would be expected if the disease were transmitted by drinking milk.

Fifty-two persons were reported to have had direct contact with cows. In 36 cases, it was not stated whether this was more than the occasional contact of living on a place where cows were kept. In 8 cases, the patient was said to have milked cows, and 8 other patients took care of an aborting cow. Only 1 person was noted to have been in contact with goats alone, and 6 with pigs alone. Undoubtedly, a number of the 52 patients who had been in contact with cows also came in contact with pigs, and a few may have been in contact with goats. However, except for the 8 who were in contact with aborting cows, the disease may very well have been contracted through the drinking of milk rather than by contact with animals.

Prevalence in Urban and Rural Groups

When the cases are tabulated according to the size of the community, it becomes apparent that the smaller the city or town, the higher the rate of undulant fever (Table 1). This distribution of

TABLE 1. *Distribution of Undulant Fever by Size of Community (Massachusetts, 1931–1940).*

POPULATION	NUMBER OF CASES	ANNUAL RATE PER 100,000 POPULATION	PERCENTAGE OF MILK PASTEURIZED
Over 25,000	85	0.3	98.3
10,000–25,000	90	1.2	78.2
5000–10,000	47	1.4	65.0
2500–5000	47	2.4	58.5
Under 2500	56	2.8	?
	325	0.8	85.9

the cases is, of course, also inversely proportional to the use of pasteurized milk, since the smaller the community, the smaller the amount of pasteurized milk used. This points very strongly to raw milk as the source of the disease, which is in line with what would be expected in view of the fact that one sixth of the dairy cattle in Massachusetts are probably infected with Bang's disease.

The same relation is seen when the cases are tabulated by counties. The more rural the county

TABLE 2. *Distribution of Undulant Fever by Counties (Massachusetts, 1931–1940).*

COUNTY	NO. OF CASES			ANNUAL RATE PER 100,000 POPULATION	PERCENTAGE OF MILK PASTEURIZED
	1931–35	1936–40	TOTAL		
Barnstable	0	4	4	1.1	71.4
Berkshire	12	37	49	4.1	47.1
Bristol	6	15	21	0.5	77.5
Dukes*	1	2	3	3.3	22.0
Essex	8	18	26	0.6	88.1
Franklin	9	12	21	4.0	51.5
Hampden	3	13	16	0.6	90.5
Hampshire	6	5	11	1.4	43.7
Middlesex	13	25	38	0.4	96.4
Norfolk	7	13	20	0.6	86.1
Plymouth	4	14	18	1.2	70.7
Suffolk	3	5	8	0.1	99.8
Worcester	26	64	90	1.8	71.7
	98	227	325	0.8	86.4

*Including Nantucket.

and the less the amount of pasteurized milk used, the higher the rate of undulant fever (Table 2).

Symptoms

The six chief symptoms are listed in Table 3. Fever was the most prominent one, being recorded in 84 per cent of the 272 cases in which symptoms

TABLE 3. *Frequency of Symptoms by Sex.*

SYMPTOM	MALES		FEMALES		TOTAL	
	NO. OF CASES	PER CENT	NO. OF CASES	PER CENT	NO. OF CASES	PER CENT
Fever	162	87	65	76	227	84
Chills	86	46	43	50	129	48
Sweats	86	46	27	31	113	42
Weakness	71	38	34	40	105	39
Headache	58	31	22	26	80	29
General aches	44	24	15	18	59	22

were recorded. Chills occurred in nearly half the cases, and sweats and weakness were present in about 40 per cent. The only other prominent symptom was a complaint of general aches, including pains in the joints, muscles, back, neck and shoulders.

Among the many other symptoms mentioned, some were no doubt associated with the brucellar infection, but others may have been due to coincidental conditions. These symptoms, in order of frequency, were: malaise, 43 cases; loss of appetite, 34; loss of weight, 28; nausea, 19; listlessness, 17; abdominal pain, 12; vomiting, 7. Dizziness, restlessness, insomnia, prostration, diarrhea, cough, dyspnea and a few other symptoms were mentioned occasionally.

An attempt was made to estimate the severity of the symptoms. Nearly three quarters of the cases appeared to be moderate in severity, less than 10 per cent were severe, and the remainder

were mild or subclinical. Symptoms were slightly milder in females than in males. Age seemed to have little influence on severity except that, in patients under ten years of age, the cases tended to be either mild or severe, the proportion of moderately severe cases decreasing to less than 50 per cent; in the older ages, about 75 per cent of the cases were moderately severe.

Another criterion of the severity is the delay in the discovery of the cases as measured by the time elapsing from the onset of symptoms to the reporting of the case. One would expect that the milder the symptoms the greater the delay. Nearly half the cases were not reported until from one to three months after onset, and in about one eighth the delay was even longer. The fact that among females there was a longer delay after the fourth week indicates either that the symptoms were milder or that the infection was more frequently confused with some other disease in that sex.

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Agglutination Tests

Of the 178 cases in which the results of agglutination tests were recorded, 109 showed positive reactions in dilutions from 1:135 to 1:1215 inclusive; 44 showed positive reactions in dilutions greater than 1:1215, whereas only 6 showed positive reactions in dilutions less than 1:135. In 19 cases, it was stated merely that the agglutination was positive, and no titer was given. There was no significant difference in the distribution of these varying degrees of agglutination by age. In 169 cases, it was possible to estimate the time that elapsed between the onset and the last test performed. Two patients in whom the titer was less than 1:135 were tested only early in the disease. As would be expected, those in whom the last test was less than four weeks after the onset of the disease tended to have titers somewhat lower than those in whom the last test was made after that time. There was no marked difference in agglutination tests in the two sexes.

Probable Source of Infection

It has already been noted that only a few cases can be explained by direct contact with infected animals. For this reason, considerable attention was directed to the source of the milk supply of those who became ill. Table 4 gives the kind of milk that was used regularly. It will be noted that almost 80 per cent of the patients gave a history of using raw milk regularly, less than 10 per cent used pasteurized milk regularly, and about 11 per cent made no statement about the regular milk supply. Many of these patients, in addition to using milk from their regular supply, obtained milk on occasion from other sources. Twenty-five per cent of those who had a secondary milk supply used raw milk either occasionally or frequently.

An analysis of the 32 cases in persons who claimed that their primary milk was pasteurized is illuminating. Fourteen of these obtained raw

TABLE 4. *Kind of Milk Used Regularly in Reported Cases of Undulant Fever.*

KIND OF MILK	NO. OF CASES	PER CENT
Raw	215	63.8
Raw and pasteurized	52	15.4
Pasteurized	32	9.5
Not stated	38	11.3
	337	

milk from secondary sources, 7 frequently and 7 occasionally. Eleven of the remaining 18 were recorded as not having used any raw milk. Of these, 2 had handled aborting cows, 3 had handled carcasses of animals, 1 worked at a piggery where other cases of undulant fever had occurred, 1 had no symptoms, and 1 showed a positive agglutination reaction after a skin test had been performed; in the remaining 3, there was suspicion that raw milk had been used. Seven of the 18 histories contained no statement concerning a secondary milk supply. Of these, 3 patients were in contact with cows or pigs, 2 may have become infected from cheese, the diagnosis was questionable in 1 case, and the last patient probably used some raw milk.

An analysis of the 38 cases in which there was no statement about the primary milk supply is also of interest. Fifteen of these patients lived in communities in which pasteurized milk was not regularly available, and it is logical to conclude that they used raw milk. Eight others used raw milk from secondary sources. Two had handled aborting cows, 1 was a laboratory infection, 5 had no record of a confirming agglutination test, and in the remaining 7 the use of raw milk could be neither excluded nor verified.

In many cases, information was collected about the dairy herds when a raw milk supply was involved. Records concerning 93 herds in which abortus testing had been done were available. Eighty-six of these herds showed reactors, only 7 being entirely free of Bang's disease. In 175 cases, there was a statement of whether abortions had occurred in the herd; in 76 (44 per cent), the answer was in the affirmative.

Relation of Prevalence of Undulant Fever To Milk Regulations

Since undulant fever was not recognized in Massachusetts before about 1920 and was not recorded regularly until after 1930, it is impossible to submit statistics to show whether the disease has been increasing or decreasing. It is believed, however, that the prevalence of undulant fever has declined in the same manner as that of other milk-borne diseases as the quality and safety of milk supplies have improved.

The great impetus to place safeguards around milk in Massachusetts was given by the epidemics of milk-borne septic sore throat that were striking one community after another in the years immediately following 1911. The use of pasteurized milk increased progressively, occasional outbreaks of milk-borne diphtheria, scarlet fever and typhoid fever giving further emphasis to the need for such safeguards. The large outbreak of nearly 1000 cases of septic sore throat, with 48 deaths, in Lee in 1928, however, initiated action by local boards of health to require pasteurization or certification of all milk sold. Beginning with Boston in that year, one after another of the communities in the State have required that only safe milk may be sold, until at the present time seventy-seven communities, representing almost 80 per cent of the population, have regulations requiring pasteurization or certification of all milk sold.

The number of outbreaks traced to milk has progressively decreased with the increased use of pasteurized milk. From a peak of forty-five outbreaks, with 4255 cases, in the five-year period 1911–1915, the number has dropped to 4 outbreaks, with 331 cases, in the five-year period 1936–1940. No deaths have resulted from epidemics of milk-borne disease in the last five years. No cases of diphtheria have been traced to milk since 1925; the last milk-borne outbreak of typhoid fever occurred in 1932; and the last scarlet-fever outbreak due to milk was in 1933. The outbreaks during the last five years were due to streptococcal sore throat and undulant fever, all on raw-milk routes.

It is estimated that almost 90 per cent of the milk sold in the State is now pasteurized. Other communities are expected to pass regulations requiring pasteurization or certification in the near future, making the prospects good for a further decrease in milk-borne disease.

Summary and Conclusions

A summary is given of 337 epidemiologic case records from 345 cases of undulant fever in Massachusetts occurring since 1927.

The number of cases reported has increased, probably owing to an increased alertness of physicians in recognizing the disease. The number of agglutination tests for undulant fever performed by the State Laboratory has rapidly increased.

There is little tendency for cases to predominate in any season.

The age and sex distributions parallel those reported from other parts of this country.

Danger of infection is not limited to any particular occupation in Massachusetts.

The disease is most prevalent in rural areas where little pasteurized milk is sold.

Most of those ill of the disease give a history of the use of raw milk, either regularly or occasionally.

With almost 80 per cent of the population of the State living in communities requiring pasteurization or certification of all milk sold and with almost 90 per cent of the milk consumed already pasteurized, milk-borne disease can be expected to remain at a low level.

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COMMUNITY SUPERVISION OF MENTAL DEFECTIVES IN MASSACHUSETTS*

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FOR many years, mentally defective children have been referred to as "institutional problems." This belief has come into being since 1848, when the first state school was opened in Massachusetts. Quite commonly, physicians, nurses, social agencies and practically all social workers have associated mental deficiency with institutional placement. The resultant concentrated demand has created crowded state schools and long waiting lists. With institutional care as the advocated and generally accepted solution of the problem, the possibilities of community adjustment of mental defectives have received scant attention. Paradoxically, this situation has come about in spite of the fact that community supervision by parents, and satisfactory supervision in all but a few cases, had been going on long before the establishment of state schools. What is the history of community supervision, and what are the possibilities of community adjustment of mental defectives? Is there any other answer than institutional care for cases of mental deficiency?

In 1915, the state schools of Massachusetts[1] began to experiment with the thought of placing trained boys and girls in the community at wages. This was started with some diffidence since, up to that time, there had been a rather firm belief that mental deficiency was a permanent institutional problem. In fact, the late Dr. Walter E. Fernald once said that no mental defective should be released from a state school. After he saw some of the work being done at the Wrentham State School by Dr. George L. Wallace, he[2] had an extensive study made of the outcome of boys and girls who had left his school at Waverley and returned to the community. These children had been removed from the school against Dr. Fernald's advice. He found that many had turned out favorably, and that his pessimistic predictions of earlier years had not been justified.

For the last twenty-five years, state schools have conducted a parole program for girls and boys who have been able to profit by the training offered by the schools. They are placed in paying positions in the community and are supervised by the social workers of the respective schools. At the end of 1940, 233 girls and 106 boys were on parole from the Fernald, Wrentham and Belchertown state schools. The 339 on parole earned a total of $45,747.84 during 1940. This is an average of $134.95 for each, or an average weekly wage of $2.60 in addition to maintenance. This amount is not large, but when one realizes the rather limited accomplishments of many of these boys and girls, it is not unreasonable. The main thought to be preserved is that children once considered total losses economically and socially, because of mental deficiency, have now been made into self-supporting citizens. Monthly checking by the social workers of working and living conditions, wages received and other financial exchanges between employer and employee obviates exploitation.

During the last fifteen years, however, another type of community supervision has come into being. The overcrowding of the three state schools has made it impossible for children seeking admission to receive the desired training in such a school. Complicated social problems and difficult home situations have been observed in many of these children. There is urgent need for early admission, but the impossibility of admitting more children to already overcrowded buildings is obvious. In this situation, it has become necessary that the Department of Mental Health take some means to offer at least temporary relief. The suggestion for a plan of community supervision by the department came from Dr. Fernald himself, thus showing the willingness of a great man to reverse a former decision. In 1921, Dr. Fernald in collaboration with Dr. George M. Kline, at that time the Commissioner of Mental Diseases, elaborated the statute (Section 66A, Chapter 123, of the General Laws) that legalizes the commitment of feebleminded persons to the department for community supervision. The original bill was amended in 1924, when the division of mental deficiency, whose personnel comprised a psychiatrist, two social workers and one stenographer, was created within the central department. Since then, the number of social workers has been increased to three. From time to time, the supervisional work has been expanded, developed and

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altered to meet the new and changing needs of the community.

Mentally defective children are referred for supervision by public and private agencies, as well as by individuals. The patients carried by the division fall into six general groups. In the following discussion, the different groups are arranged in accordance with the ages at which the patients are referred, the youngest being considered first.

Groups of Patients

Home-Training Group

The home-training children are the youngest placed under our care. They include children of preschool or school age, with mental ages from two years or less to about six years. Because of their low mentality, these children have been refused admission to school, or have been excluded from regular classes or special classes. They are at home without anything to occupy their time, and the parents need advice and help in providing necessary training. In other situations, children are awaiting admission to a state school. Owing to overcrowded conditions and the resulting long waiting lists, immediate admission is not possible. Thus, some definite plan to promote the adjustment of the child in his own home is urgently necessary.

Since 1937, home training and teaching lessons have been provided to aid these children. Outlined lessons and materials have been prepared for the following three classifications: Group A, mental age less than two years; Group B, mental age two to four years; Group C, mental age four to six years. A complete psychologic and mental examination is obtained early, since it aids the worker in assigning lessons and materials suitable to the mental age of the individual child. The social worker visits the home each month, and outlines and teaches a new lesson to the child and the mother. The parent then continues the lesson work for an hour or two each day. The successive lessons that make up the child's "school book" are printed on paper of different color and used primarily as a teaching aid for the parents. The attractive colored materials for the carrying out of each part of the lesson are provided at a minimum cost to the parents, or are supplied gratis if circumstances warrant.[3]

After learning to do simple handwork suited to his mental age, the child gains proficiency and is able to occupy himself in a constructive manner. He soon reacts to success in these tasks and almost invariably becomes a better adjusted member of the family group. In addition, the teaching of the lesson work by the parents often gives them their first real understanding of their child's mentality. From that point on, they begin to plan for him on his own mental level. During the visits, the parents have frequent opportunities to discuss with the social worker any problems or conflicts arising in connection with the adjustment of a mentally deficient child. Institutionalization of many children has been postponed. As the child becomes adjusted in the home, the parents show less interest in placing him in an institution. In several cases, children previously excluded from school have shown great progress. After one or two years of home-training lessons, during which they have learned color, numbers, letters and simple school work, some of these children have improved so much that they have been able to return to special classes and remain in school indefinitely. About 55 of these boys and girls are being supervised by the division, and the referrals to this particular group are increasing each year.

Special-Class Group

The special-class group comprises children now being cared for within the public-school system. After examination by a traveling school clinic, the psychiatrist in charge may recommend special-class placement and social supervision. The divisional social workers visit the home and explain to the parents the difficulties experienced by the child in school and the advantages offered by the special class. In this way, the parents gain an understanding of the value of special-class training and how it may influence the development of work aptitudes on the part of the child. Very often, the parents have many other questions and problems to discuss with the social worker. Recreation, summer-camp placement, medical care and other assistance are included in the supervision of these boys and girls when the parents cannot arrange for them.

With older children attending special classes, analyses are made by the social worker and school teacher to plan vocational training and placement. After leaving the special class, the patient may be carried for supervision or placed in a training home. The child may be discharged if it is known that he is being satisfactorily cared for by the family or an agency.

Training-Home Group

Cases placed in training homes prior to wage placement are made up of girls seventeen to twenty-five years of age who have reached their capacity in regular-class or special-class work. The intelligence quotient ranges from 58 to 69. Some have been removed from unfavorable homes and environments, have no parents, and are under the complete care of the Department of Mental Health

as committed cases (Chapter 123, Section 66A, of the General Laws). Others have interested parents who pay all expenses incurred by their daughters in the training home, and are classified as voluntary cases. The training-home supervision and the medical, dental and recreational care are the same for both groups. The girls are placed in carefully selected and thoroughly investigated homes with an understanding foster mother who gives special instruction in housework, care of children, cooking and general training. The goal of future wage placement is emphasized at all times.

The social worker and the foster mother plan a course of training, which is carried out daily in the home. The progress and failures of the girls are checked frequently by the social worker through interviews. At regular intervals, the girls are instructed to make a record of their daily duties. Their accomplishments, attitudes, general appearance, conduct and progress, as well as their failures, are noted by the foster mother on the same report. In this way, knowledge of their efficiency and progress is gained and recorded. The girls are encouraged to attend church, 4-H clubs and suitable community activities where understanding persons are in charge. Protection and good influence are very valuable for retarded girls of these ages, since they are very impressionable and show the same response to either constructive or destructive influences. Under the present plan, two or three girls are placed in a training home, and a definite schedule of training for each is worked out with the foster mother. With frequent check-ups, the social worker can evaluate progress and judge how soon the girl will be ready for placement in a wage home.

The training requires from six months to two years, depending on the mental level of the patient. The annual expense of about $350 is small if one considers that the training makes a self-supporting worker out of a potential dependent. To date, there has been a greater demand for girls trained in housework than the division could supply. As soon as a girl learns the basic routine in a training home, it is almost certain that there will be a suitable home waiting for her in the community.

Wage-Earning Group

The cases in the wage-earning group have comprised the principal type of supervisional work since the beginning of the division. Until recently, there were no funds for training potential wage earners. As a consequence, only retarded young women who gave indication of their ability to work and support themselves could be accepted for supervision. These women are usually from twenty-one to thirty years of age, with an intelligence quotient ranging from 60 to 69. They are accepted as either committed or voluntary cases, depending on their background and circumstances. After a thorough investigation, the woman is placed at wages in a home in which it is thought that the employer and other circumstances will favor adjustment. She receives room, board and wages commensurate with her ability. Some have begun with wages as low as $1.00 a week and progressed to $8.00 a week. The average wage is between $3.00 and $4.50 a week. At the outset, the employer is informed frankly of the young woman's characteristics, plus or minus. She is also instructed in the art of dealing with the mentally deficient, if it happens that she has not had previous experience with them. She is told also of the part the employer must play in the supervision program and the regulations required by the department.

Each month, the employer returns to the division a wage report, which has been signed by the woman. This states the employee's wages, the weekly spending money given to her and the remaining amount sent in for banking. Her banking and purchases of clothing, and her medical, dental and recreational care are supervised by the social worker, who makes frequent visits to the employer and the employee to discuss any problems that may come up. In some cases, it has been necessary to make changes after a time and place the woman in a new working home. In these cases, another young woman is placed with the original employer. Most of these changes have worked out to the advantage of both the employer and the employee.

Experience with the wage-earning group has taught us that mental defectives, with supervision, can be influenced to carry on in the community as responsible, self-supporting citizens. Without guidance, they are easily swayed by doubtful influences and may become community responsibilities rather than assets.

Family-Care Group

The boarding-out or family-care cases have been placed by the division since 1938, when funds were appropriated for this purpose. Board is paid for two different types of patients: those who are potential wage earners and have already been described in the group trained in homes prior to wage placement; and those who constitute typical institutional cases of the lower mental ratings, with no ability for work training. Because of the overcrowded conditions of the state schools,

it has been necessary to provide boarding care for a few girls on the waiting list who cannot be continued in their homes. Surprisingly, it has been found that certain mental defectives may become satisfactorily adjusted in another home, although they were making no progress whatever in their own homes. In general, boarding care is less expensive than state-school maintenance, although the margin is not great.* If the patient is committed to the department, the State pays the board. If the commitment is voluntary, the board is paid by relatives. In either event, the social worker investigates possible homes and selects the one considered most suitable for the patient. The foster mother is told frankly about the type of patient who is to be placed with her, and is given full opportunity to decide whether she desires to assume such a responsibility.

After a patient is placed in a home, the social worker visits frequently to aid the patient in adjusting herself to the new surroundings, and to assist the foster mother in understanding and dealing with the many problems associated with the mentally deficient. The patient's medical and dental care, clothing and recreation are supervised by the social worker. Arrangements have been made with state hospitals near the boarding homes for the patients' medical and dental care and for their attendance at church services and recreational programs.

The patients placed out during the last two years have been those of the imbecile level, with intelligence quotients between 35 and 49. Chronologically their ages have been from sixteen to sixty-eight years. For example, a girl sixteen years of age could not adjust herself to her own home, and institutional care seemed imperative. Because the state schools had no space available, the division was asked to find a suitable home. The board and all expenses were paid by her family. She has made a good adjustment in a quiet home with an understanding and patient foster mother. Two men, both sixty-eight years of age, who had been in a state school for over forty years, were transferred to the division and placed on a farm where their board was paid by the State. Both men have intelligence quotients around 50 and enjoy little duties, such as feeding chickens and simple chores. They have made a good adjustment in their new homes and are extremely happy. One wonders whether or not the forty years within an institution were necessary.

Although the boarding-out plan is a new venture for the division, it has been very successful. Overcrowded state institutions and long waiting lists demand an answer. Patients who have benefited from years of training and discipline at a state school but are not suitable for wage placements do very well. This is not only a very happy change for the patient but also effects a small saving for the State. In other cases, mental defectives who are poorly adjusted in their own homes because of unalterable circumstances make unexpected adjustments in foster homes. The family-care plan lessens the expense to the State and makes room in the schools for patients who cannot be cared for except by institutionalization.†

*The annual expense ($350) for boarding care may be analyzed as follows: board, $234; medical and dental care, clothing and so forth, $90; social supervision, $26. Annual charges for maintenance for 1940 in state schools were $363 per patient.

General Supervision and Consultation Group

The general supervision and consultation cases are referred by various public and private agencies as well as by individuals. The patients under general supervision are often older boys and girls who do not classify in any of the other five groups. Usually, they are being cared for in their own homes. Their parents or relatives are able to take care of their physical needs, but require guidance and assistance from time to time in dealing with the difficulties and problems associated with mentally deficient children or adults. Even an occasional contact with the patient and his family has been found to have a stabilizing effect on the family situation.

Consultation cases are those in which the division acts as an adviser to the referring agency or family. After investigation, the patient may be found to be suitable for supervision in one of the five groups already described. On the other hand, by reason of legal and financial limitations, the division cannot assume the care of certain types of cases, such as defective delinquents, patients incapacitated by severe physical infirmities and patients suffering from mental disease. Anyone referring such cases is directed to organizations that deal with these specific types. Likewise, cases of extreme mental deficiency, which cannot be supervised in the community by the division, are referred to state schools as urgent institutional cases.

Many family and children's agencies recognize mentally deficient cases among their clients and seek advice from the division. First, a complete mental and physical examination is made. A complete picture of the patient is arrived at by means of social and educational investigations, and also by physical, mental and psychologic examinations.

†Family care from a state school was placed in operation in 1938, by Dr. George E. McPherson, superintendent of the Belchertown State School. About 50 older patients are being carried in suitable homes in the community. The beds vacated thus become available for younger and trainable patients on the waiting list. This service is in addition to the usual parole placements at wages being carried out at Belchertown.

After this procedure, the diagnosis, prognosis and course of action are summed up and discussed at a staff meeting. The referring agency is often willing to carry on the supervision if it may consult the division from time to time. The division co-operates with many community social agencies, schools, churches and clubs, and with individuals who seek advice about mentally deficient children or adults.

Legal Status of Cases Under Supervision

Committed and voluntary status has been mentioned in describing the different placement groups. When the department indicates its approval, any mentally deficient person may be committed to the Division of Mental Deficiency for supervision.* The six types of cases outlined previously may be supervised on the voluntary status, but ordinarily the committed cases are placed in training homes prior to wage placement, in the wage-earning group or the boarding-out or family-care group. The Division of Mental Deficiency, by law, has the complete care and supervision of the patient, including supervision of the patient's funds. In most cases, commitment is used because the patient has no suitable person to look out for his welfare. If he is under the family-care plan, his board and maintenance are paid by the State. However, the majority of the committed cases are self-supporting. The voluntary cases usually have relatives who are able to take the financial responsibility but need assistance in the care and supervision of the patient in the community.

Comment

The six classifications of cases supervised by the division show the scope of work being done for the 300 cases of mental deficiency supervised in the community. In the early stages of this work, about fifteen years ago, mental deficiency was not recognized so promptly as it is at the present time. The examinations and diagnoses of mental deficiency by the traveling school clinics, by the outpatient clinics of the state mental hospitals and schools and by the habit clinics have brought about a growing awareness among private and public agencies, as well as the general community, of the problems of mental deficiency. Consequently, younger patients are being referred to state schools, clinics and to the Division of Mental Deficiency each year. The shift in type of case referred has changed the emphasis to supervision of the younger mentally deficient. In many cases, early recognition of the condition and helping parents to understand their retarded child have effected a satisfactory adjustment of the child in his own home and have indefinitely postponed institutional placement. When home adjustment is impossible, training homes and boarding homes have proved to be satisfactory as well as economical, and have taken some of the burden that previously went to the institutions.

When one realizes the growing number of recognized mentally deficient persons, it seems altogether reasonable that every possible plan be made to start the training of this group at an early age so that the number of maladjusted mental defectives may be kept at a minimum. Public and private agencies are showing an increasing interest in arriving at a complete understanding of this problem. The assistance they can offer should be developed to the greatest degree, since the care of mental defectives must become more of a community responsibility as time goes on. At the end of 1940, a total of over 54.000 mental defectives were known to the Department of Mental Health, through its Central Registry of Mental Defectives. Over 4000 new cases of mental deficiency are being discovered each year. The Commonwealth can never assume the cost of providing institutional care for all this group. Many mental defectives require institutional care, but that is not the answer to the problem of mental deficiency, taken as a whole. The development and success of community supervision of mental defectives have proved its practicability. An increase in the personnel of the Division of Mental Deficiency is urgently needed to extend the work on a statewide basis. The Commonwealth should do everything possible to assist mentally deficient persons to a satisfactory social and economic adjustment in the home and in the community. Institutionalization should be the last thought, after all other resources have been exhausted.

*Section 66A, Chapter 123, of the General Laws reads: "*Commitment to Department.* If an alleged feeble-minded person is found, upon examination by a physician qualified as provided by section fifty-three, to be a proper subject for commitment, the judge of probate for the county in which such person resides or is found may upon application commit him to the custody or supervision of the department; but no person shall be so committed unless the approval of the department shall be filed with the application for his commitment. If he is committed to the custody or supervision of the department, the department shall thereafter have power, whenever advisable, to transfer him to a state school for the feeble-minded, or may cause an application to be made for his removal to a department for defective delinquents, and such person may be so removed in the manner provided by section one hundred and sixteen. If the alleged feeble-minded person is committed to the custody or supervision of the department of mental diseases, the said department may temporarily release him in the manner provided by, and subject to, the provisions of section eighty-eight, or may discharge him under section eighty-nine."

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DIABETES INSIPIDUS IN ONE OF TWINS*

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IN the course of an investigation of a group of 30 patients with diabetes insipidus, I found that one patient, now an eighteen-year-old boy, had a nonidentical twin sister who did not have this disease. The twins differed so markedly in stature, general configuration and progress of growth that it appeared of interest to present their cases.

CASE REPORTS

John's history. John has had diabetes insipidus since the age of 5½ years, and I have observed him for the past 7 years. He was born 10 minutes before his twin sister. He and his twin each weighed 7 pounds at birth and were of normal height. The delivery, like the pregnancy, was normal and was performed at home without instruments. The patient had a healthy infancy and gained moderately well. He has had a pigeon breast since birth; he was given cod-liver oil from the age of 3 months, and orange juice until he was 3 years old. He developed his first tooth at 6 months and walked at 15 months. He had measles, mumps and chicken pox. About 6 months before the onset of the diabetes insipidus, he hurt his head, which raises the question whether the injury had anything to do with the precipitation of the disease; x-ray studies of the skull were negative. At the onset of the disease, the daily fluid intake and output were 3 to 4 liters, and he voided about every 15 minutes. When he was about 8 years old, his mother noted that he was not growing so fast as his twin sister, and as time went on, this difference in weight and height became more marked. Like his twin, he did well at school until his second year at high school, when he did poorly; he had to withdraw from school the following year. At the age of 11 years, the daily fluid intake and output without pituitary therapy were about 6 to 7 liters — at present, these are about 9 to 10 liters. Pituitary extract administered intranasally or intramuscularly has always reduced the urine volume to normal. At 18, his physical development was retarded, and he had not matured sexually; he did not have to shave. He had become extremely sarcastic. Six months later, however, the patient showed marked sexual changes and had become considerably calmer. His voice had become deeper, and there was a beginning growth of hair on the face and a considerable growth of pubic hair, although it had a female distribution. The penis was 5 inches long, and he had daily erections; the testes, too, were normal in size.

TABLE 1. *Laboratory Data.*

DATUM	WITH PITUITARY EXTRACT	WITHOUT PITUITARY EXTRACT
Serum		
Calcium (mg./100 cc.)	10.6	10.1
Phosphorus (mg./100 cc.)	4.6	4.3
Chloride (mg./100 cc.)	363	364
Total protein (gm./100 cc.)	5.9	6.2
Albumin (gm./100 cc.)	4.0	3.9
Globulin (gm./100 cc.)	1.9	2.3
Sugar (mg./100 cc.)	107	106
Cholesterol (mg./100 cc.)	175	
Hematocrit (%)	38	41

Physical examination was not remarkable, except for stunted growth. The basal metabolic rate was −9 per cent at the age of 14 years.

The laboratory data are given in Table 1.

Joan's history. Joan's birth was normal, and she had a healthy childhood and normal subsequent maturity. She had a normal growth, unlike her twin brother. She is now a tall, well-built and attractive girl. She was bright at school and graduated from high school at the age of 17 years. She has a pleasant personality, in contrast to John. During her childhood, she had much the same diet as her twin brother.

The menses began at the age of 13 years, and they have been regular and normal since then. The basal metabolic rate was −19 per cent at the age of 14 years. Physical examination is entirely negative.

Family histories. The father, mother, three brothers and one sister appear to be well and normally developed. There is no history of diabetes.

Comparative physical characteristics of the twins. The difference in the general appearance of these twins has been striking, as illustrated in Figure 1. Joan, at the age of 18 years, is a well-developed, mature girl who is about a head taller and 25 pounds heavier than John, who appears stunted in growth and underdeveloped.

Table 2 presents a record of the progress of the twins' height and weight at intervals of approximately 1 year.

Comparative x-ray studies of twins. When the twins were 14 years old, x-ray films of the skull and right hand and wrist were obtained to determine whether there was any difference in their bony development. The reports were as follows:

TABLE 2. *Record of Height and Weight of Twins.*

AGE	JOHN		JOAN	
	HEIGHT	WEIGHT	HEIGHT	WEIGHT
yr.	*in.*	*lb.*	*in.*	*lb.*
5			41	38
6	44	39	43	42
7			45	49
8	46	46	48	53
9	47	48	50	57
10	49	51	53¼	65
11	49½	52	53¾	65
12	51½	56	56	71
13	53½	62	58½	77
14	55	64	61	92
15	57	73	62¼	97
16	58	76	63½	102
17	60¼	81	64½	106
18	62	85	66	111

Films of John's skull shows a smooth vault, with no localized changes or signs of pressure; no abnormal calcification is seen and the dental development is

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normal. In the film of the right hand and wrist, all the epiphyses are wide open.

Films of Joan's skull show it to be normal; it is 0.8 cm. greater in anteroposterior diameter than that of her twin. There is no appreciable difference in the dental development. A film of the right hand and wrist shows that the epiphyses of the terminal phalanges are closed and the others maturing; in other words, there is a difference of 2 or 3 years in bone age.

At the age of 17 years, the twins were x-rayed again; the reports were as follows:

Re-examination of John's skull shows a smooth vault, with no localized changes and no general signs of pressure; the sella turcica remains normal. Re-examination of the right hand and wrist shows all epiphyses open, with not even the changes of maturation (Fig. 2). The findings indicate a definite delay in epiphyseal union.

Re-examination of Joan's skull shows the sella to be normal, with no signs of intracranial pressure and no localized lesions. Re-examination of the right hand and wrist shows all epiphyses closed (Fig. 2); the bones appear normally developed.

Comparing the films of the twins at the age of 14 years and those at the age of 17 years, there has been no appreciable growth of the skull in either case. Comparing the hands, there has been no growth of Joan's bones, but John's have definitely grown, being 1 cm. longer from the base of the third metacarpal to the tip of the finger during that time. In spite of this, his epiphyseal development is delayed. Apparently, Joan got her growth earlier, and her epiphyses matured earlier. John's growth and epiphyseal union have both been delayed.

At the age of 18½ years, x-ray films of John showed no change in the cranial vault or in the sella. The mandible appeared slightly larger and heavier, and the second molars had erupted since the examination 18 months previously. The right hand and wrist showed only slight changes, indicating beginning maturation of the epiphyses, particularly at the proximal end of the proximal phalanx of the middle finger. All the epiphyses were still open, and growth had not yet ceased.

All the films were interpreted by Dr. M. C. Sosman.

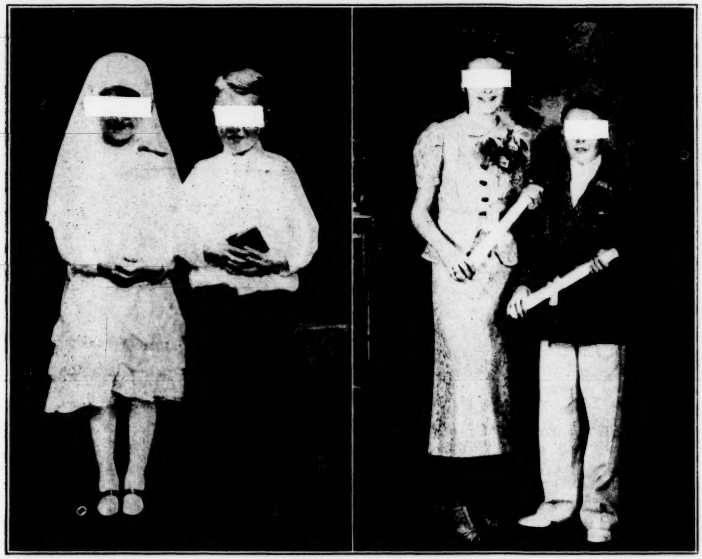

FIGURE 1. *Photographs of the Twins.*
The one on the left was taken when they were eight years old; that on the right, when they were fourteen.

DISCUSSION

These twins are of interest because one twin developed diabetes insipidus at the age of five and a half years and subsequently had a retarded growth and development. In contrast, the other twin grew and matured normally. The x-ray findings are of interest because the twin with diabetes insipidus had a smaller skull than his twin sister and also because all the epiphyses of the right hand and wrist were open at the age of eighteen and a half years, whereas his twin sister's epiph-

yses were closed at seventeen years. The findings indicated a definite delay in epiphyseal union in the twin with diabetes insipidus.

Patients with diabetes insipidus do not necessarily have a retarded growth and development, although some do. With such a striking difference in the progress of growth of these twins, it appears that a disturbance in the anterior pituitary gland of the twin with diabetes insipidus interfered with his growth and bony development.

FIGURE 2. *X-ray Films of the Right Hand of Each Twin at the Age of Seventeen Years. At the left, the film of the normal twin's hand is shown; at the right, that of the twin with diabetes insipidus, in which the epiphyses are open.*

In the literature, I have been unable to find any reference to the occurrence of diabetes insipidus in one or both twins. Weil[1] and his son[2] discussed the inherited tendencies or the familial characteristics of diabetes insipidus. They described in detail the 220 members of five generations of one family, headed by a man with diabetes insipidus, and reported that 35 cases of diabetes insipidus occurred among them. In none of these cases were there twins.

SUMMARY

This report presents a study of a pair of eighteen-year-old nonidentical twins, one of whom developed diabetes insipidus at the age of five and a half years. The twin with diabetes insipidus had retarded growth and development. The normal twin grew and matured normally.

The x-ray findings of the right hand and wrist were interesting because there was a definite delay in the epiphyseal union in the twin with diabetes insipidus.

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MEDICAL PROGRESS

INDUSTRIAL HYGIENE

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ANY branch of medicine may be broadened along two main lines: through an increase in scientific knowledge, such as discoveries in individual laboratories or clinics, and through widespread application of new discoveries, that is, through popularization. Both lines are of definite importance, since only the widespread application of new discoveries can justify the great expenditures of time and money necessary to research.

Industrial hygiene is concerned with the preservation and improvement of the health of workers. In this field, many significant advances have been made in the last few years, but not until very recently has any emphasis been placed on the application of these advances to as large a proportion of the industrial population as possible. Before 1936, there were only half a dozen state departments conducting industrial-hygiene activities in even a limited way.[1] Under the stimulus of funds supplied wholly or in part by the federal government, thirty-two states and four cities now support industrial-hygiene units,[2] and these states have a working population of forty million people. Thus, the mechanism is being rapidly perfected for bringing about widespread application of the knowledge of industrial hygiene.

It is through the general practitioner that the new discoveries of industrial hygiene must be brought to the worker, for only 15 per cent of workers in this country have the advantage of full-time medical services during working hours.[3] Industrial absenteeism due to injury and sickness can be greatly influenced by the skill with which the private practitioner handles these cases,[4] and on him rests the responsibility for recognizing early, and treating correctly, disorders caused by industrial operations and environment. He must also have the preventive side of the picture in mind and must seek to determine whether measures may be taken to reduce the frequency of the illnesses being treated. It has been said that any community may decide for itself whether or not it wishes to suffer from diphtheria. Just as truly may it be said that any industry may decide whether or not health is to be threatened by employment in its plants.

Both state and federal industrial-hygiene units are set up to study problems and furnish advice along medical, chemical and engineering lines. In addition, most state medical societies have a committee on industrial health or the equivalent. It is to agencies such as these that the private practitioner should turn when new problems in the field of industrial hygiene arise.

DERMATITIS

Skin irritation from substances used in industry present numerically the greatest number of industrially induced cases of disease. As industry develops, so do new methods and chemicals that frequently cause skin irritation, even though the more serious toxic manifestations are not found. Sterner[5] states that, in one company alone, from 10,000 to 12,000 different chemicals are employed, and that between one and several hundred employees may be exposed to any of them.

Among the commoner causes of dermatitis in industry are the cutting oils. These oils apparently cause dermatitis by blocking the sebaceous glands.[6] Because of this mechanical blocking, the natural oily secretions of the skin are held back, accumulate, harden, and eventually cause enough irritation to produce a dermatitis. Infection also plays a part, but is believed to be produced by organisms normally present on the skin.[7] For cleansing the oil from the skin, a mixture of pure liquid soap and sawdust in equal parts has been recommended. Klauder et al.[8] have suggested the use of a mixture containing 45 per cent each of sulfonated neat's-foot oil and light liquid petrolatum and 10 per cent of a 25 per cent aqueous solution of gelatin. To one part by weight of the oil mixture are added one and a half parts of white granulated corn meal. Chlorobutanol (0.5 per cent) may be added to prevent mold or bacterial growth. This mixture of corn-meal oil replaces harsh abrasive soaps and brushes or rags in the daily cleansing of the skin. Klauder's article contains valuable formulas for other skin-cleansing detergents and skin protective creams that may be satisfactorily used in numerous industrial conditions.

All articles in this series will be published in book form: the current volume is *Medical Progress: Annual, 1940* (Springfield, Illinois: Charles C Thomas Company, 1941. $4.00).

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Other industrial causes of dermatitis are too numerous to list, but attention should be called to the chlorinated naphthalenes, chlorinated hydrocarbons[9] and the general class of substances known as resins.[10] The use of these materials is increasing, but an accurate diagnosis can be made only by careful search into the occupational history of the patient.

From the wide variety of industrial substances known to cause dermatitis, it is apparent that they may act in several ways. The dermatitis may result from primary irritation or mechanical action, or may be an allergic response. At one time, it was thought that hypersensitive persons could be determined by pre-employment patch testing. Experience has shown this method to be impractical, since a large proportion of industrial allergic sensitivity is acquired only after employment and contact with the offending substance for weeks or months.

An infectious disease of occupational origin that first manifests itself by the appearance of a typical skin lesion is anthrax. The incidence of this condition is increasing, and fatal results can be prevented only by early diagnosis and treatment. The use of serum is still the method of choice for combating infection and toxemia.[11]

Benzol

Because of its physical and chemical characteristics, benzol is one of the best solvents from the industrial point of view. From the standpoint of health, however, it is one of the most dangerous to use, since it is likely to cause disorders of the blood-forming organs. Recent studies by several investigators have done much to show how protean are the early manifestations of the action of small amounts of benzol on the body. Most industrial workers inhale the fumes of benzol, and are chronically poisoned by this method, rather than through skin absorption. Evidence of benzol exposure and absorption may be found by a change of the inorganic-total sulfate ratio of the urine.[12, 13] Bowditch and Elkins,[14] in studying this ratio among workers exposed to benzol, found that it was lowered after exposure to benzol vapors. Although this test alone does not indicate benzol poisoning, it is a good measure of the amount of benzol absorption following exposure.

The initial blood changes in benzol poisoning are of the utmost significance, since it is only by early detection of this condition that extensive damage can be prevented. Hunter[15] found many types of blood changes resulting from benzol—polycythemia, anemia, leukocytosis, leukopenia, leukemoid blood conditions, eosinophilia, megalocytosis and microcytosis. He states that the early diagnosis of poisoning depends on an evaluation of the complete blood picture rather than on the existence of a leukopenia. Erf and Rhoads[16] studied the blood picture in early benzol poisoning and also found an extremely varied, but abnormal, blood picture. They noted anemia, leukopenia, thrombocytopenia and elevation of reticulocyte counts as commonly occurring changes. Greenburg et al.,[17] in a study of 332 workers exposed to benzol, found the following significant abnormalities: an anemia; an increase in the mean corpuscular volume of the red cells; and a reduction in blood platelets. These workers state that too great reliance should not be placed on the leukocyte count *alone* as a rapid means of detecting cases of benzene poisoning. In their experience, leukopenia was found more frequently in severe than in early cases.

Goldwater[18] decided from studying a large group of patients exposed to benzol vapors that the abnormalities most frequently observed were anemia, macrocytosis and thrombocytopenia. In a later study of recovery from chronic, mild benzol poisoning, he[19] found that damage to the blood-forming organs may persist for at least two years following cessation of exposure, although the majority of people recover within fourteen months.

From these and other studies, authorities have attempted to set a safe limit for the amount of benzol that may be in the air breathed by workmen. One group[20] has suggested 75 parts per million as a safe and attainable figure, whereas another observer[15] rather pessimistically says, "It is doubtful whether any concentration of benzene greater than zero is safe over a long period of time."

With these new methods for diagnosing benzol poisoning available, it is incumbent on all physicians treating workers who might possibly be exposed to benzol vapors to study such patients from this point of view. If the old-time concept of leukopenia is thought of as the sole diagnostic sign of benzol poisoning, most of the chronic, and sometimes fatal, cases of benzol poisoning will be overlooked.

Carbon Disulfide

Hamilton,[21] in reviewing carbon disulfide poisoning, points out that diagnosis is difficult, since so many of the symptoms are subjective. The mental symptoms, which are most striking, range from simple irritability and depression to manic-depressive insanity. Other symptoms are neuritis,

ocular manifestations,— such as enlargement of the blind spot and diminution of the corneal reflex,— dermatitis and gastrointestinal disturbances. From the laboratory side of the picture, diagnosis may be made more certain by analyzing biologic fluids for their carbon disulfide content according to the method of McKee.[22] Since this falls rapidly after exposure ceases, analyses must be made during or shortly after the period of exposure.

Lead

Progress in the diagnosis of lead poisoning has been made primarily in the laboratory. More sensitive methods for the analysis of urine and blood are a great aid in confirming or refuting a tentative diagnosis of lead poisoning. The most important advances in technic have been made by Willoughby and Wilkins,[23] Ross and Lucas[24] and Kehoe et al.[25] Parenthetically, it may be stated that the accurate determination of lead in blood and urine is one to be undertaken only by a skilled chemist. A number of state occupational-hygiene agencies are capable of making these tests, and the practitioner will do well to get in touch with such units when he desires to have the tests made.

Mercury

One of the recent bright spots in the prevention of disease concerns the use of mercury in the fur-felt hat industry. "Mad as a hatter" is a phrase that has long been a byword in the English language; translated into terms of industrial medicine, it means simply an occupational mercury poisoning such as the felt-hat maker has frequently acquired. Mercury is used for "carroting" fur, a process by which fur is so changed that it may be made into felt. Through the combined efforts of industrialists, laborers, physicians and governmental agencies, it was decided that only nonmercury-carroted fur could be used for felt-hat making in the United States after December 1, 1941.[26, 27] This splendid step forward, possible only through the co-operation of all interested groups, is an example of how such problems might well be attacked. When the prevalence of mercury poisoning in the fur-felt hat industry was recognized, an effort was made to find substitutes for the process in which mercury was used. After such substitutes had been found, industry willingly co-operated to replace the highly dangerous process with a far safer one.[28]

Concentration of Chemicals in Air

To clarify the question of air concentrations of toxic substances that are considered compatible with safe working conditions, Table 1 is given. In it, the air concentration of the industrial substance is expressed as parts per million (p.p.m.) unless otherwise specified. This list is abstracted from that recently published by a group conversant with this problem.[20]

Table 1. *Suggested Maximum Safe Concentration of Certain Industrial Chemicals.*

Gas or Vapor	Concentration p.p.m.	Gas or Vapor	Concentration p.p.m.
Ammonia	100	Lead	0.15*
Amyl acetate	400	Mercury	0.10*
Arsine	1	Methanol	200
Benzene (benzol)	75	Nitrobenzene	5
Carbon disulfide	15	Nitrogen oxides	10
Carbon monoxide	100	Ozone	1
Carbon tetrachloride	100	Phosgene	1
Chloronaphthalene	1 to 5*	Phosphine	2
Ether	400	Sulfur dioxide	10
Formaldehyde	20	Tetrachlorethane	10
Gasoline	1000	Toluene	200
Hydrogen cyanide	20	Trichlorethylene	200
Hydrogen sulfide	20	Zinc oxide	15*

*Milligrams per cubic meter.

The Future

Each new chemical introduced to industry is a potential health hazard until proved otherwise. Under the present stimulus of national defense, the use of certain materials has increased tremendously. Although most of these are chemicals with which the practitioner is more or less familiar, the industry of war utilizes some materials peculiar to itself. The following are mentioned to warn how and where danger may be expected.

Tetryl is an explosive that is notorious for the amount of dermatitis it causes among those handling it. Silver[29] has reviewed the subject thoroughly with reference to workers in England affected during the present war.

Trinitrotoluene (TNT) causes both dermatitis and general systemic disease. The earliest sign of systemic poisoning is a mild cyanosis. Moderate exposure frequently causes anemia, whereas severe poisoning may cause acute yellow atrophy of the liver or an aplastic anemia.[30, 31]

Radium is being used in large amounts to produce luminescent paints. As these paints are applied to such objects as airplane-instrument dials, it is readily seen that the quantity used will steadily become larger. Radium poisoning, with resultant bone tumors, is well known, but if radium is handled according to specifications recently issued by the Bureau of Standards, such tragic accidents should not occur.[32]

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CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICOPATHOLOGICAL EXERCISES

FOUNDED BY RICHARD C. CABOT

TRACY B. MALLORY, M.D., *Editor*

CASE 27501

PRESENTATION OF CASE

A thirty-six-year-old factory worker was admitted to the hospital because of pain in the right shoulder.

He was well until the insidious onset of intermittent dull aching pain in the right shoulder, about six months before entry. After two months, he was aware of swelling of the shoulder and limitation of motion upward and backward. The pain gradually increased in intensity, became constant, and radiated to the tips of the fingers of the right hand. In the few weeks preceding entry, the pain was so severe that the patient was scarcely able to sleep. There was a loss of 6 pounds in weight. A physician, consulted early during the illness, told the patient that he had "rheumatism." Four days before entry, this physician took a roentgenogram of the shoulder and, on the basis of the film, referred the patient to the hospital.

The patient's mother had died of carcinoma of the stomach. There was no other family history of cancer. The patient had always been in good health, except for a railway accident twenty-six years before entry in which part of his left leg was avulsed, necessitating skin-graft treatment.

On admission, the patient appeared thin, with obvious swelling of the upper right arm and shoulder. This swelling consisted of a peach-sized mass, apparently situated deeply between the neck of the humerus, the acromion and the distal end of the clavicle. A stony-hard small mass and a soft small mass, both freely movable, were palpable in the position of lymph nodes of the right axilla. The arm was held in 40° abduction, at rest, and could be abducted to only 90°. External and internal rotation were likewise limited, and the arm could not be placed behind the back. The chest was clear, and physical examination was otherwise negative, except for signs of old injury to the left lower leg, which was bowed anteriorly and covered by tense, scaling, atrophic skin.

The temperature, pulse and respirations were normal. The blood pressure was 138 systolic, 80 diastolic.

Examination of the blood showed a white-cell count of 11,100 and 95 per cent hemoglobin. The blood calcium was 11.3 mg. and the phosphorus 3.4 mg. per 100 cc., and the phosphatase was 16.3 Bodansky units. The urine was normal.

A roentgenogram of the right shoulder showed destruction within the upper end of the shaft of the humerus, with extensive condensation of the bone and some new-bone formation. Discrete areas of calcification were evident, high in the axilla. Roentgenograms of the chest and abdomen were negative.

On the fifth hospital day, an operation was performed.

DIFFERENTIAL DIAGNOSIS

DR. CLIFFORD C. FRANSEEN: This history could fit in with a number of lesions, and we shall have to rely heavily on the x-ray findings for our diagnosis.

DR. JAMES R. LINGLEY: The films show this extensive lesion involving the proximal extremity of the humerus, characterized by bone destruction and a large amount of new-bone formation. The new bone extends out into the soft tissue for a considerable distance, and there are separate discrete areas of calcification high up in the axilla. The chest shows no evidence of disease.

DR. FRANSEEN: I was inclined, before I saw the x-ray films, to discount the small calcified mass in the axilla, which was described as small and stony hard, as incidental, but a view of the films suggests that the mass is definitely related to the lesion in the shoulder. It is not infrequent in cancer of the breast to see calcified lymph nodes in the axilla or supraclavicular region, which often make it difficult to decide whether metastases are present. Sometimes, for example, the presence of calcified supraclavicular lymph nodes may mislead one in deciding whether a radical mastectomy should be done.

I see no alternative but to go through the usual routine of differential diagnosis. When it is difficult to make a diagnosis, it is customary to deplore the lack of further information. The blood serologic findings in this case are not reported. Before seeing the films, I had syphilis in mind, perhaps because I was sensitized to the diagnosis by a recent case in a man of this age who also had involvement of the upper end of the humerus. There is obviously a large soft-tissue mass suggestive of tumor, and although syphilis can simulate any lesion of bone, certainly there is nothing about this case that, on first glance, suggests syphilis to me. The blood chemical findings are

a little puzzling, and I wonder if they had any relation to this lesion. There is a good deal of calcification for some reason, and it may have been that that amount of calcification or mobilization of calcium was responsible for the slightly elevated blood calcium. In Aub's[1] series of calcium determinations, the average normal was 10.8 per 100 cc. (Fiske method), and in only 3 cases, among several hundred examined, it ranged from 11.0 to 11.3 mg. It is difficult to know why it should be so high in this case. Of course in the last two or three years, a good many cases of various bone lesions have been reported with elevated calcium. Multiple myeloma is particularly notorious in this respect, but in most of these cases the phosphorus is more nearly normal. Consequently, on the basis of these blood chemical findings alone, I do not believe that we can make any flat-footed statement. The phosphatase of 16.3 Bodansky units, of course, is elevated, perhaps to four times normal, and with the amount of new-bone formation here, this value is perfectly compatible with the observations in the x-ray study concerning the presence of ossification.

Tuberculosis always comes to mind. My experience with tuberculosis is rather limited. The patient was rather old, since tuberculosis is usually a juvenile disease. It can occur in this location, but there is a large soft-tissue tumor mass in conjunction with the lesion. I do not consider tuberculosis very seriously for these reasons.

We have already ruled out syphilis, but the elevated phosphatase reminded me that we had one patient with an elevated phosphatase apparently caused by antisyphilitic treatment. When patients receive Coley's toxins for tumors of the bone, toxic hepatitis, in addition to some elevation of the phosphatase, results. If the patient had received either of these treatments, it could possibly be the explanation here.

The picture does not look at all characteristic of osteomyelitis to me, with so much new-bone formation in this region. Obviously, there is a large mass, which does not seem to be inflammatory.

Granulomas of bone do not have to be considered seriously. They are almost purely destructive, and so far as I know, the end of a long bone is an unusual site for them.

Hyperparathyroidism is suggested only because of the blood chemical findings, but certainly the x-ray picture does not suggest anything I am familiar with in this disease.

Lymphoma has been reported to simulate various types of bone tumors, sometimes with considerable production of new bone. There is nothing else about the patient to suggest the diagnosis. He lost 6 pounds in weight, and there are other things suggesting that there might have been some underlying systemic condition, but certainly it was not characteristic of the usual picture of lymphoma of bone, which more commonly occurs

FIGURE 1. *Sclerosing Osteogenic Sarcoma of the Head of the Humerus, with Two of the Ossified Lymph-Node Metastases.*

in the late stages when it is evident elsewhere in the body.

Ewing's tumor could occur in this man. He was at the upper limits, perhaps, of the age when it is most common, and there was an unusual amount of new-bone formation. The lesion was near the head of the bone, which is a less likely site.

The presence of so much calcification in the tissues, and even in the lymph nodes, presumably, disturbs me a good deal. I know of no case of osteogenic sarcoma in which there has been calcification in the regional nodes themselves. Calcification occurs in the lungs in metastases from osteogenic sarcoma, and I have done phosphatase determinations on the tissues in these nodules and found them as high as that in the original tumor. I remember a case at the Palmer Memorial Hospital in which the lymph nodes suggested disease in the x-ray picture, but at the time of operation these nodes were removed and showed no calcification by pathological examination.

I have never seen any metastatic lesions that had laid down so much new bone, and the man is also relatively young. There is nothing about the picture to suggest Paget's disease. The other thing one would have to think of with so much calcification around the joint is a Charcot joint or, possibly, the condition that resembles it on x-ray examination and is secondary to syringomyelia. There is no suggestion here of such disorganization of the structures of the bone. We have no serologic evidence of syphilis, so far as Charcot's joint goes, but the lesion could occur without it from syringomyelia.

I am left with nothing but low-grade osteogenic sarcoma to consider. I have seen cases of osteogenic sarcoma with a good deal of calcification in the surrounding tissues. I am at a loss to explain the case on any other basis with the evidence at hand. A conclusive diagnosis would depend on the results of the biopsy examination.

Dr. Lingley: The roentgen appearance of the lesion in the humerus is typical of osteogenic sarcoma. The case is very interesting to me because I have never seen calcified osteogenic-sarcoma metastases in lymph nodes. I have seen them in the lungs, but not in the regional lymph nodes. It appears that such a metastasis occurred in this case.

Dr. Grantley W. Taylor: We were very much interested in this problem in the Tumor Clinic, and we believed that we should confirm the diagnosis by biopsy of one of the nodes before proceeding to therapy. We were able to confirm the diagnosis of osteogenic sarcoma from one of the lymph nodes. The case is uniquely interesting because lymph-node metastases from osteogenic sarcoma are very rare. In any event, Dr. Shields Warren,[2] when he reported metastases from various types of sarcomas in his series, had only one case of lymph-node metastasis from osteogenic sarcoma. There are a few others. Dr. Thomas J. Anglem had a case similar to this in which actual bone formation was taking place in the regional lymph nodes; but such cases must be extremely rare, since both lymph-node involvement and calcification are rather unusual in metastases of osteogenic sarcoma. Ossifying metastasis even in the lungs is rare enough to excite comment, and here we have the two unusual features combined in one case.

Dr. Franseen: I went over all the bone tumors at the Rädiumhemnet in Sweden to see if I could find any case with metastases to the nodes, but I could not find one case.

Clinical Diagnosis

Osteogenic sarcoma of humerus, with metastases to axillary lymph nodes.

Dr. Franseen's Diagnosis

Osteogenic sarcoma of humerus.

Anatomical Diagnosis

Osteogenic sarcoma of humerus, with ossifying metastases in the regional nodes.

Pathological Discussion

Dr. Tracy B. Mallory: I presented this case before the American College of Surgeons when Dr. Murray Copeland was present, and he said he had seen a number of cases of osteogenic sarcoma with metastases to nodes; in fact, he put the figure as high as 5 to 7 per cent, which was ever so much higher than I should have supposed. I suspect that the figures were probably compiled from autopsy material rather than from clinical examination.

This patient had a number of calcified nodes in the axilla that showed extensive ossification. The primary tumor was a very characteristic osteogenic sarcoma arising in all probability in the diaphysis just next to the epiphyseal line, but it had crossed it and invaded the head extensively. Microscopically, it is a relatively slowly growing, sclerosing tumor, with marked bone formation. The picture in the lymph nodes is indistinguishable from that in the primary tumor.

Dr. Taylor: Is there definite evidence that these lymph nodes had been invaded by the disease?

DR. MALLORY: In one, in particular, we could see a central mass of bone completely surrounded by lymphoid tissue.

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CASE 27502

PRESENTATION OF CASE

A twenty-six-year-old single woman entered the hospital complaining of a rash on the skin.

Seven weeks before entry, the patient developed a chill and some fever. She continued to have fever and at least one chill each day for the following week. During the second week of her illness, the chills were less frequent, but the fever persisted. Five weeks before entry, a red spot appeared on the right cheek. This continued gradually to spread over both cheeks, nose, neck, upper part of chest, arms and finally to the legs. The patient soon noticed that her fingers were also very red and sore. Three weeks before admission, she began to have a considerable amount of putrid, often blood-stained discharge from her nose.. During this period, she went downhill steadily, slept poorly, and had a very poor appetite.

Her father had died of influenzal pneumonia at the age of thirty-nine. Her mother, two brothers and one sister were living and well. There was no history of any chronic disease in the family.

Ten years before entry, the patient was admitted to this hospital for enlarged cervical lymph nodes. A biopsy was done, and a diagnosis of tuberculous adenitis was made. After leaving the hospital, she went to a sanatorium, where she gained 52 pounds in thirteen months. She remained at home for about a year and a half and then returned to the sanatorium because her hands had begun to swell and had become painful. She was finally discharged after three years and was well at home for about two years. During this period, her hands became deformed.

Physical examination showed a poorly developed and very poorly nourished woman, lying quietly in bed, who appeared acutely ill. The skin over the nose and cheeks was very red and slightly indurated. Smaller bright-red, smooth areas were found on the neck and upper part of the sternum. There were similar lesions, about 5 cm. in extent, on the upper part of the back at about the seventh to ninth dorsal spines. The skin of the arms, particularly the extensor surfaces, had many of these flat, red, slightly indurated lesions, which had coalesced, giving an almost complete involvement of the skin. The fingertips were red, tender and in some places cracked open. The legs had more widely scattered lesions. There were a few excoriations over the abdomen. The mucous membrane of the mouth and nose showed a few scattered hemorrhagic spots. The breath was very foul. There was a foul-smelling, abundant, mucopurulent hemorrhagic discharge from the nose. The teeth were in fair condition. The gums were dark red and hemorrhagic. All the cervical, axillary and inguinal lymph nodes were enlarged, some up to 1 or 2 cm. in diameter; they were hard and slightly tender. Both hands were deformed by an arthritic process and could not be opened or closed; the phalangeal joints were enlarged.

The temperature was 102.1°F., the pulse 116, and the respirations 26.

Examination of the urine showed a specific gravity of 1.008 and a sediment containing 10 to 12 white blood cells in small clumps, many cellular and granular casts and numerous bacilli per high-power field. Examination of the blood showed a red-cell count of 3,720,000 with a hemoglobin of 70 per cent, and a white-cell count of 3900 with 70 per cent polymorphonuclears. A blood Hinton reaction was negative. The bleeding time was 3½ minutes. The nonprotein nitrogen was 21 mg., the cholesterol 83 mg. and the serum protein 7.7 gm. per 100 cc.

A chest film showed marked calcification of all the lymph nodes in the neck. This calcification lay over both apices, so that it was difficult to decide whether the process was in the lung fields. There was no beading or mottling suggestive of tuberculous activity.

The temperature ranged between 99 and 102°F. The joint pains were quite severe, and the patient was given 75 gr. of sodium salicylate daily. She developed edema of the face and complained of a sore throat. Salicylates were stopped because of marked vomiting. On the thirteenth day, she became comatose, and rales were heard in the chest. She had more bleeding from the mouth and died that day.

DIFFERENTIAL DIAGNOSIS

DR. THOMAS A. WARTHIN: Certainly, the acute onset of septic constitutional symptoms, followed by the appearance of a widely disseminated bright-red rash, narrows the differential diagnosis to a small group of disturbances. Typhoid fever can be dismissed immediately because of the character of the skin lesions. So also can the septicemia group, including subacute bacterial endocarditis, meningococcemia, and staphylococcal, colon bacillus and streptococcal infections. Erythema multi-

forme, associated perhaps with severe acute rheumatic fever, would undoubtedly have exhibited a number of typical vesicular lesions of the iris. Undulant fever, when associated with skin manifestations, presents a more discrete papular eruption. The rickettsial diseases are of shorter duration than the infection in this case, and their petechial and hemorrhagic rashes do not coalesce so strikingly. I know of no fungous infection associated with skin eruptions in which papular or pustular lesions do not predominate. The negative blood Hinton reaction completes rejection of syphilis as a possibility.

When the patient was sixteen, cervical tuberculous adenitis was proved by biopsy, and the patient was apparently successfully treated for over a year at a sanatorium. However, she did return one and a half years later for treatment of painful swelling of her hands, and remained in the institution for three years. During this time, her hands became deformed. Bilateral deforming involvement of the hands due to tuberculous dactylitis appears mainly in infants. Sarcoid does not fit into the picture of the terminal illness and, in addition, that diagnosis would force us to conclude that the lymph-node biopsy had been incorrectly interpreted. We are told that this deformity was due to an arthritic process, which makes scleroderma unlikely. Furthermore, the patient was in a younger age group than most patients with scleroderma, and no mention is made of associated Raynaud's phenomena.

Could miliary tuberculosis and tuberculosis cutis explain the final illness? I believe not, since there is no evidence of miliary tuberculosis in the chest film. In addition, lupus vulgaris sclerosis erythematoides, which closely simulates lupus erythematosus, is accompanied by marked rather than slightly indurated skin lesions. This results in considerable scarring in the center of the lesions, which this case lacked. Ulceration is very prone to occur in tuberculosis cutis of this type.

For final consideration, we have the group of closely related diseases with vascular disturbances, namely, disseminated lupus erythematosus, Libman–Sachs syndrome and periarteritis nodosa. Scleroderma and dermatomyositis also have more or less generalized vascular lesions, but they clinically present quite different pictures, atrophy of the skin and swelling of the muscles predominating, respectively. Periarteritis nodosa commonly affects males, and the presenting symptomatology is apt to be related to the renal, abdominal, neuromuscular, cardiac or bronchial systems rather than to the skin. Cutaneous lesions of many types besides nodules along superficial arteries have been described. Leukocytosis, with or without eosinophilia, rather than leukopenia, characteristically occurs in periarteritis.

If one lists the characteristics of this case, one is immediately struck by consistent similarities with disseminated lupus. The patient was a woman, and was in the second to fourth decades of life. She suffered from the frequently present tuberculous adenitis, which has clouded the theories of etiology of the disease. The onset of the final illness was fulminating, with the chills and fever that may occur in a severe case. Chills are not characteristic, but may be present; it is possible that a pyelitis immediately preceded the lupus. The rash appeared after the onset, as it frequently does. Unfortunately, we are not told whether exposure to sunlight precipitated or intensified the rash. The rash was typical in that it first appeared on the face, with gradual spread to the neck, chest, arms and, finally, the legs. It was characteristically bright red and slightly indurated, with a tendency to coalesce. It involved the fingers, and as frequently occurs, the mucous membranes of the hands were involved, but had been so for several years. It is possible that the lesions occurred during an early phase of the disease, in a subacute form that became quiescent, only to flare up acutely seven weeks before the final entry. Such remissions occur frequently in periarteritis nodosa, and less commonly in lupus. Her long stay in the sanatorium stimulates this speculation, and without it one would be forced to add another diagnosis, that of rheumatoid arthritis. As described, the hands could have been rheumatoid, but it is surprising that no other joints were affected. We are told nothing about eyegrounds, blood pressure, lungs or abdomen, and I consequently assume that they were normal, although the involvement of serous surfaces is common. Nausea, vomiting, edema of the face and joint pain are frequently observed.

The laboratory studies revealed the numerous casts so frequently seen in disseminated lupus, and evidence of some bacilluria and pus. These bacilli were probably secondary invaders, although it is possible that a pyelitis precipitated the final illness. However, the kidneys were not severely involved, as indicated by the nonprotein nitrogen level. Usually, there is some azotemia in lupus. The blood count reveals bone-marrow depression by the typical anemia and leukopenia. The chest x-ray film helps rule out a miliary tuberculosis. The final coma, in addition to the rales, is in keeping with terminal lupus. Without mention of heart murmurs, it is difficult to consider the Libman–Sachs syndrome. No blood cultures are

recorded, so that I assume none were done. No mention is made of the white-centered petechiae that are found in endocarditis of the verrucous type. There are many pathologists who believe that no clear-cut findings are available to differentiate lupus and Libman–Sachs syndromes except greater than average involvement of the endothelium. This is especially true of cardiac valvular disturbance.

Without any evidence for the diagnosis except the statistics that almost 50 per cent of cases of disseminated lupus have coarse verrucous endocarditis, it seems best to ignore this pitfall. My diagnoses, therefore, are disseminated lupus erythematosus, healed tuberculous adenitis and terminal pneumonia. It is possible that the arthritis was rheumatoid in type and that there was an incidental pyelonephritis.

Clinical Diagnoses

Lupus erythematosus disseminatus.
Arthritis deformans.
Tuberculosis of lymph nodes.

Dr. Warthin's Diagnoses

Lupus erythematosus disseminatus.
Tuberculous adenitis, healed.
Pneumonia, terminal.
Arthritis, rheumatoid?
Pyelonephritis?

Anatomical Diagnoses

Acute disseminated lupus erythematosus.
Polyserositis, chronic fibrous.
Bronchopneumonia.
Generalized lymphadenopathy.
Tuberculosis of cervical lymph nodes.
Rheumatoid arthritis of wrist and phalanges?

Pathological Discussion

Dr. Tracy B. Mallory: This is one of the cases that discourage the morphologist. The immediate cause of death was, of course, a terminal bronchopneumonia, but of the fundamental underlying disease there was extremely little visual evidence. The skin rash was still present but was naturally much less vivid than it had been during life. Slight fibrous adhesions were found in both pleural cavities, in the pericardium and between the diaphragm and the upper surface of the liver, to indicate that the patient had had at one time a polyserositis. There was no endocarditis, and all the visceral organs except the lungs were entirely normal. A few old calcified lymph nodes were found in the lower cervical region, but there was no evidence of active tuberculosis. One evidence of probable activity besides the skin rash was the finding of a generalized lymph adenopathy. The retroperitoneal lymph nodes, for instance, were more or less uniformly about 1 cm. in diameter, pink, soft and edematous.

Microscopic examination gave us little more information. The lymph nodes did show congestion and necrosis of the germinal centers, a very constant finding in acute disseminated lupus. A few lymphocytes were found in the pericardium and pleura. The cervical lymph nodes showed completely inactive tuberculosis. Even the kidneys proved entirely normal—not only were there no wire-loop lesions, but even focal glomerulonephritis, which in our experience is frequent in this disease, was lacking. The most important function of the pathologist in such a case is to rule out other disease entities. That we could easily do, and hence there can be no doubt that Dr. Warthin's diagnosis of acute disseminated lupus was correct. It is quite unusual in lupus to see permanent changes in the involved joints. Unfortunately, we did not have permission to examine the joints of the hands in this patient, and we therefore cannot rule out the possibility of a complicating rheumatoid arthritis.

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THE RELATION OF THE PRACTICING PHYSICIAN TO INDUSTRIAL MEDICINE

Two articles in this issue of the *Journal* call attention to the important role played by the practicing physician in industrial medicine. As Mr. Bloomfield, of the Division of Industrial Hygiene, United States Public Health Service, points out, the majority of industrial workers are not furnished with medical care by full-time or part-time plant physicians. Furthermore, the chief causes of disability are illnesses arising from nonindustrial diseases, which, in many cases, result from poor living conditions, improper diets and contagious diseases among the workers' families.

Because of the tremendous increase in industrial activity demanded by the defense program and because of the accompanying hazards occasioned by the speeding-up of production and by the introduction of new methods, the demands for highly trained industrial physicians are much greater than they were several years ago, in spite of the fact that, during the last decade, there has been a gradually widening appreciation of the value of the application of the modern principles of industrial medicine, both to the worker and to the employer. As previously stated, however, the practicing physician is still chiefly concerned with the health of the employee, and it is on him that a great part of the success of the defense effort depends. He should be thoroughly familiar with the details of proper first-aid care, he should be cognizant of symptoms and signs of the commoner industrial intoxicants, he should not fail to consult with his state authorities concerning definite or doubtful cases of industrial disease, and he should give advice regarding improvement of living conditions and diet to the workers and their families. All in all, his responsibility is great and should not be shirked.

BRUCELLOSIS AND PASTEURIZATION OF MILK

Investigators of the problem of undulant fever or brucellosis claim that in various sections of the United States from 5 to 10 per cent of healthy adults give evidence — by positive agglutination or intradermal tests — of having been infected with *Brucella abortus* at one time or another. Dustin and Weyler[1] go so far as to claim that among 4000 patients seen in private practice in Providence, Rhode Island, about 10 per cent gave what they considered sufficient clinical and laboratory evidence to warrant a diagnosis of chronic brucellosis. Such data are difficult to correlate with the figures of the Bacteriological Laboratory, Massachusetts Department of Public Health,[2] which for 1940 show that only about 4 per cent of the serums from cases of suspected brucellosis gave positive agglutination reactions, and those of the Bacteriological Laboratory, Boston City Hospital,[3] which in the last two years list only one positive reaction among serums from approximately 400 cases of unexplained fever on admission. It seems

logical to conclude that either one or the other group of tests is at fault, or that the incidence of brucellosis in Massachusetts is exceptionally low. As a matter of fact, both factors probably play a role.

The so-called "slide technic" has been, and still is, the generally accepted method of testing serums for agglutinating antibodies against *Br. abortus*. The preparations are examined under the microscope, and spontaneous or nonspecific agglutination is apt to be interpreted as being due to the presence of antibodies. On the other hand, the laboratories of the Massachusetts Department of Public Health and the Boston City Hospital have adopted the so-called "tube technic," in which a living or killed suspension of organisms is added to tubes containing various dilutions of serum, and the results are read macroscopically or with a hand lens. Although the latter method is possibly somewhat less sensitive than the former, positive tests are significant — a fact that explains, at least to some extent, the discrepancy between the reported results.

Even if one assumes that agglutinating antibodies are present in 2 to 5 per cent of the serums from healthy adults in other sections of the country, the figures of 4 and 0.25 per cent for cases of suspected brucellosis or unexplained fever, respectively, in Massachusetts are remarkably low, and the only reasonable explanation is the fact that nearly 90 per cent of the milk consumed in Massachusetts is pasteurized. That only 4 of the 52 cases of brucellosis in 1940 occurred in twenty-four contiguous communities in Metropolitan Boston, which contain 40 per cent of the total population of the State and where pasteurization regulations are in effect, and that only 1 case occurred among some 85,000 patients at the Boston City Hospital, are facts that corroborate the evidence given elsewhere in this issue of the *Journal* concerning the effectiveness of pasteurization as a preventive measure against brucellosis.

Such evidence, together with the fact that pasteurization of milk is effective against contamination by tubercle bacilli, typhoid and paratyphoid bacilli and streptococci, offers a strong argument in favor of the nation-wide adoption of regulations requiring pasteurization. To permit the marketing of raw milk is to subject the inhabitants of any community to needless danger.

References

1. Dustin, C. C., and Weyler, H. L. C. Chronic brucellosis. *New Eng. J. Med.* 222:670-673, 1940.
2. Feemster, R. F. Personal communication.
3. Nye, R. N. Personal communication.

MEDICAL EPONYM

Litten's Sign

Professor Moritz Litten (1845–1907), of Berlin, reported "Ueber die normaliter bei jeder Respiration am Thorax sichtbaren Zwerchfellsbewegungen: Eine physiologisch-klinische Beobachtung [On the Movements of the Diaphragm Normally Visible on the Thorax with Each Respiration: A physiologicoclinical observation]" in the *Deutsche medizinische Wochenschrift* (**18:** 273–275, 1892). A portion of the translation follows:

> I have observed that it is possible to see the movements of the diaphragm . . . on the thorax in all healthy men. The phenomenon takes the form of a wave motion that, beginning on both sides at the height of the sixth intercostal space, travels downward with maximum inspiration in the form of a straight line or shallow furrow (which makes an acute angle with the ribs) over several intercostal spaces, at times as far as the costal margin. With expiration, it rises again over the same area.

A more detailed account of the phenomenon is given in the paper, "Das Zwerchfellphänomen und seine Bedeutung vom physiologischen und klinischen Standpunkte [The Diaphragm Phenomenon and Its Significance from the Physiological and Clinical Standpoint]," which appeared in the *Verhandlungen des Kongresses für innere Medizin* (**13:** 309–319, 1895). A portion of the translation follows:

> The patient to be studied is placed in a horizontal position . . . with his feet toward the window, while the examiner, standing three or four steps away with his back toward the window, observes him from an angle of about forty-five degrees. . . . We are convinced that in a dark room the phenomenon is visible only if a source of light is so placed that the beams strike the thorax from the direction of the feet at an acute angle with the thorax.

R. W. B.

MASSACHUSETTS MEDICAL SOCIETY

SECTION OF OBSTETRICS AND GYNECOLOGY*

Fatal Hemorrhage During Labor

A thirty-four-year-old para IX who had had no prenatal care entered the hospital in mild labor.

Physical examination was essentially negative, although the patient was in poor physical condition, anemic and rundown. Palpation of the abdomen revealed a uterus the size of a full-term pregnancy.

Five minims of pituitary extract was given, and labor progressed slowly but without untoward symptoms until six hours before delivery, when a large clot was passed. From then on, labor was normal; there was still a moderate amount of bleeding, which did not seem to be alarming until the membranes ruptured spontaneously and bleeding became profuse. The baby was delivered normally, and the placenta was expelled forty-five minutes later. Between the birth of the baby and the delivery of the placenta, it was estimated that 300 cc. of blood was lost. Fifteen minutes after the birth of the placenta, the patient died.

A partial autopsy revealed no intra-abdominal hemorrhage and no rupture of the uterus, but a low implantation of the placenta.

Comment. This death was evidently caused by hemorrhage during labor and after delivery, and the amount of blood lost during labor was undoubtedly underestimated. Autopsy revealed that hemorrhage occurred from the low placenta, whose site had become separated as the lower segment was taken up and the cervix dilated. It is possible that, had this been realized and the membranes ruptured, possibly with the insertion of a bag, the bleeding would have been entirely controlled. The hemorrhage after the birth of the baby cannot be attributed to the low attachment of the placenta and must have been due to relaxation of the uterus. It is barely possible that the placenta separated with the birth of the child, that its separation was not appreciated as soon as it should have been, and that the uterus continued to bleed behind a detached placenta.

Since the uterus was not ruptured, it is not fair to suggest that the use of pituitary extract had anything to do with the fatal outcome; however, when this drug is given in the first stage of labor, it should be given in doses of not more than 1 or 2 minims. Transfusion would have helped this patient, but it is evident that the amount of blood lost during labor and after the birth of the baby was not realized.

*A series of selected case histories by members of the section will be published weekly. Comments and questions by subscribers are solicited and will be discussed by members of the section. Letters should be addressed to Dr. Raymond S. Titus, *Secretary*, 330 Dartmouth Street, Boston.

DEATH

CRAIGIN — George A. Craigin, M.D., of Swampscott, died October 24. He was in his seventy-ninth year.

Dr. Craigin received his degree from Harvard Medical School in 1890. He was a fellow of the Massachusetts Medical Society and the American Medical Association.

He is survived by his widow and a sister.

DEFENSE ACTIVITIES

CIVILIAN DEFENSE

Office of Civilian Defense

Dr. George Baehr, chief medical officer of the Office of Civilian Defense, Washington, D. C., has announced the appointment of a subcommittee of the Advisory Board of the Medical Division, to prepare recommendations on protective procedures for hospitals in the event of belligerent action. Dr. R. C. Buerki, dean of the Graduate School of Medicine and director of hospitals of the University of Pennsylvania, Philadelphia, a member of the Medical Advisory Board, is chairman of the new subcommittee, and the members are Dr. W. C. Rappleye, commissioner of hospitals, New York City, Dr. A. J. Hockett, superintendent of Touro Infirmary, New Orleans, Dr. A. J. J. Rourke, medical superintendent of Stanford University Hospitals, San Francisco, Dr. Joseph Turner, director of Mount Sinai Hospital, New York City, and Dr. Huntington Williams, commissioner of health of Baltimore.

The subcommittee held its first meeting at the Hotel Commodore, New York City, on November 8. With Dr. J. M. Mackintosh, former chief medical officer of the Scottish Ministry of Health, as a guest to advise the group, measures for preventing or minimizing damage to buildings, handling of casualties, evacuation, provision and protection of supplies, and training of personnel for specific duties in case of bombing were discussed in detail. The basis for discussion was a study made by a committee of the American Hospital Association of physical defense of hospitals, of which Dr. Hockett is chairman. It is expected that a report will be issued jointly by this committee and the subcommittee representing the Office of Civilian Defense.

Dr. Mackintosh also conferred with the staffs of the medical and civilian protection divisions of the Office of Civilian Defense at the Washington headquarters on November 7; he described in detail Britain's organization of its protective services, its early mistakes and the measures taken to correct them. The basic organization for rescue work in a given area consists of three essential groups with a central control: police, rescue and fire services, ARP control and medical service. One of the early mistakes was the belief that it was imperative to have first-aid workers on the scene of a bombing immediately. Bitter experience showed that injured persons were usually buried under the rubble and glass of their homes and that hours of work by the demolition and rescue squads were often necessary before first aid could be given. Dr. Mackintosh emphasized the necessity for a central ambulance control. Ambulances are dispatched only by the central control and are not allowed to move from a bombed

area until routes to hospitals have been surveyed. To stop "panic calls" from individuals, private telephones are cut off the moment an air-raid warning sounds. First-aid posts, in addition to their obvious function of caring for the injured, are invaluable as rendezvous for rescue workers, physicians and nurses, as well as the general population, who may become lost in the blackout, frightened, choked and blinded by dust, he said. In the first-aid posts, the workers can clean up, have a cup of tea and return refreshed to their activities.

CORRESPONDENCE

MEDICAL OFFICERS WANTED FOR MOUNTAIN REGIMENT

To the Editor: On October 30, 1941, the Secretary of War formally announced to the public the formation of the 1st Battalion, 87th Infantry Mountain Regiment (Reinforced), at Fort Lewis, Washington. This is the first unit ever set up in the United States Army for the specific purpose of conducting winter and mountain-warfare training. The War Department has asked the assistance of the National Ski Patrol in securing names of men who wish to volunteer for this unit, and applications from physicians with interest and ability in skiing are particularly wanted. As in all branches of the services, only men physically and professionally qualified will be accepted. Details may be secured by writing to Mr. Charles M. Dole, Chairman, National Ski Patrol, 222 Graybar Building, New York City.

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National Ski Patrol

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DERMATITIS DUE TO RAGWEED

A twenty-five-old farmer was seen at my office on September 22, 1941. Two years previously, he had had an eruption on his face and arms. This was diagnosed as being due to poison ivy. Recently, while haying, he had noticed that each day his legs became very itchy. His job consisted for the most part of standing in the hay and tossing it down into the barn. A week prior to examination, an itchy eruption broke out on his legs.

Examination showed a marked eruption consisting of erythema, papules and vesicles on the back of the neck, the hands and most of the cutaneous surface of the legs. The eruption was most marked at the popliteal spaces and about the ankles. The patient was put on soothing treatment and stopped work, and was promptly relieved. On October 20, he returned to work, avoiding the hay, but doing some odd jobs about the farm. He suffered a prompt recurrence of the dermatitis. He was patch-tested with various contacts, including weeds from the farm, and showed a marked reaction, consisting of erythema, edema and vesicles, to a plant that was identified by the Bureau of Plant Industry as being common ragweed, *Ambrosia artemisiifolia*.

Although most physicians are cognizant of the reactions resulting from contact with poison ivy, oak or sumac, they are apt to forget that other plants may cause a dermatitis.

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BOOK REVIEWS

The Minds and Nerves of Soldiers. By Edward L. Hanes, M.D. 8°, cloth, 221 pp. Pasadena, California: Login Press, 1941. $3.00.

Dr. Hanes, who served as a member of the Neuropsychiatric Service of the United States Army during World War I, has reviewed his experiences and published his opinions about patients and treatment; the volume is based on an extraordinary number of private documents that he has preserved. Many of the examples given are detailed interviews between the examiner and the recruit. Others are details of the case histories of men, either injured or suffering from psychoneurotic manifestations accompanying warfare. Because this manuscript was apparently written largely at the time the observations were made, there is a freshness about the material not found in the ordinary compilation. The case histories and long notes of interviews, however, are not peculiarly integrated. Because of the author's wide experience, the book has considerable value as a record of neuropsychiatric disease occurring in American soldiers, both in this country and abroad, during World War I. There is no index.

The Avitaminoses: The chemical, clinical and pathological aspects of the vitamin deficiency diseases. By Walter H. Eddy, Ph.D., and Gilbert Dalldorf, M.D. Second edition. 8°, cloth, 519 pp., with 28 illustrations and 40 plates. Baltimore: Williams and Wilkins Company, 1941. $4.50.

As in the first edition of this excellent book, the aim of the authors is to present a small manual on the nature of the various vitamins and their functions considered from the clinical, chemical and pathological points of view. This new edition necessitated the rewriting of most of the text. A feature of work that will undoubtedly attract and profit all readers is the co-ordination and readability of the chapters. The authors make a special effort to identify underlying principles and mechanisms. A considerable number of new illustrations have been added, and the references carefully checked. It is well to quote the opinion of Dr. James Ewing, the eminent pathologist, who writes in the "Foreword," "The preparation of the first comprehensive treatise in English on the pathological responses to vitamin deficiencies emphasizes the importance of the application of morphological control in the study of vitamins."

A Textbook of Clinical Pathology. Edited by Roy R. Kracke, M.D., and Francis P. Parker, M.D. Second edition. 8°, cloth, 780 pp., with 223 illustrations, 26 tables and 34 colored plates. Baltimore: Williams and Wilkins Company, 1940. $6.00.

This is an unusually fine textbook of clinical pathology, the work of experienced teachers in the field, all of whom are teachers in the Middle Western and Southern medical schools. They have succeeded in making it a complete treatise that covers comprehensively, accurately and lucidly every aspect wherein the laboratory may aid in clinical diagnosis. The text is profusely illustrated.

The work is fully up-to-date. Among the many new features are a chapter on the determination of vitamins and hormones and, in the section on clinical chemistry, a description of the methods for determining the sulfonamides in the blood and urine.

(Continued on page viii)